

CESAREAN SECTION

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PREFACE

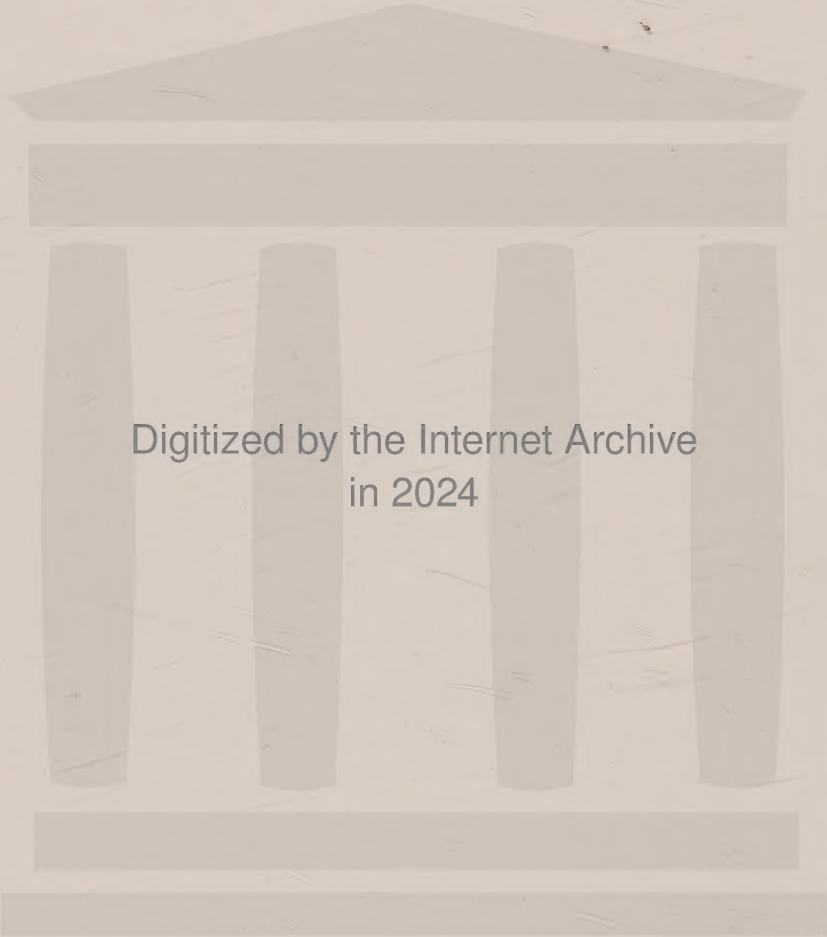
THE excuse for this book lies in the fact that, while it is recognized among well trained obstetricians that Cesarean section is one of the most valuable operations yet devised both as a life and health saving procedure for both mother and child, the results which follow the operation as it is performed in general practice are such as to suggest that comparatively few surgeons give their patients sufficient study to determine whether delivery is best to be accomplished by Cesarean section or by some other means.

The purpose of this volume is to bring out definitely in the first place the indications and contra-indications for the operation, as well as the methods of operation, in the hope that it may have some influence in diminishing the prevalent abuse of one of the most valuable obstetric procedures. I believe at the present time that Cesarean section is so commonly performed on patients who are improper risks for one reason or another that obstetric mortality and morbidity are increased rather than diminished by the operation, and that the true value of the operation can be appreciated only when it is applied to properly selected patients by competent operators.

I wish to acknowledge my indebtedness to Dr. J. Whitridge Williams and Dr. Henry Jellett for leave to reproduce various illustrations which have appeared in their textbooks on obstetrics.

FRANKLIN S. NEWELL

BOSTON



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CHAPTER I

HISTORY

Definition of Cesarean Section—Origin of the Name—Antiquity of the Operation—Operations in Uncivilized Races—Authentic History of the Operation—Four Periods: 1. Previous to 1500; 2. 1500-1876; 3. 1876-1907; 4. 1907—Early Operations, Technic and Mortality—Porro Operations, Amputation of Uterus—Sänger Operation, Use of Sutures and Preservation of Uterus—Extraperitoneal Modifications—Bibliography.

Under the term *cesarean section*, or laparohysterotomy, are included the various operations by means of which the delivery of the child is effected through an incision in the abdominal and uterine walls. The name is not properly applied to operations for the removal of the child from the abdominal cavity after rupture of the uterus or for the delivery of a child in cases of abdominal pregnancy, but should be restricted to the abdominal delivery of a child normally situated in utero.

The origin of the term "cesarean" is more or less obscure. For a long time it was popularly believed that Julius Caesar was brought into the world by this means and that he obtained his name from the operation by which his birth was accomplished (a cesa matris uteri). It is almost certain, however, that this derivation of the name is incorrect, since his mother, Julia, lived many years after his birth, as is proven by his letters to her, and furthermore, at the time when **Caesar** lived the operation is not known to have been performed on the living woman, at least in countries under Roman rule. It is also a fact that Julius **Caesar** was not the first of his name, since there is mention in Roman history of a priest named Caesar, who lived at a considerably earlier period, which proves at least that the name did not owe its origin to the method of **Caesar's** birth.

Two other plausible explanations for the origin of the name have been given: first, that the term is derived from the latin verb *cedere* (to cut), and, therefore, that it simply implies delivery by means of cutting, which is, of course, possible, since children delivered from dead mothers by abdominal section were known as "cesones." It seems more

probable, however, that the following explanation is the correct one. In 715 B. C. Numa Pompilius, the king of Rome, codified the Roman law, and in this *lex regia*, as it was called, it was ordered that abdominal section should be performed on all women who died when far advanced in pregnancy, even in cases when there was no chance of survival for the child, so that the mother and child might be buried separately. The *lex regia* became the *lex cesarea* under the rule of the emperors and the operation became known as the cesarean operation.

The antiquity of the operation on the dead is thus clearly established under early Roman civilization, and there is some slight evidence that it may have been known to the early Egyptians. Furthermore, it is referred to in the myths and folk lore of the early European races who were much less civilized, although not in terms which justify any belief that it was performed on the living woman. It is, therefore, fair to assume that a large proportion, if not all, of the early races, recognized the propriety of cesarean section on women who died late in pregnancy, in the hope of preserving a fetal life which might prove to be of value to the community.

Cesarean section on the living is of more recent date, but its beginnings are utterly obscure. It is possible, however, that it was known to certain of the early races. Various authorities are inclined to believe the certain passages in the Talmud have reference to the operation on the living, and the children delivered through the flanks of their mothers were given the name "Jotze Dofan" by the ancient Jews, although there is no evidence as to the fact of the mothers surviving the operation or that they were living when the operation was undertaken.

Perhaps the strongest suggestion of the possible early development of cesarean section on the living among uncivilized peoples is furnished by the operation witnessed by Dr. Felkin in Uganda in 1879, performed by a native specialist. The operator evidently possessed distinctly more knowledge of asepsis than his civilized confrères of that period, since he washed his hands and the field of operation with banana wine before operating, instead of deferring the cleansing of his hands until after operation, as was more or less the rule in civilized practice at that time. The patient was anesthetized by being made drunk with the same preparation. A rapid incision of the abdominal wall and uterus was done, the child removed and the cord cut. The placenta was then removed, the cervix dilated from above, and the uterus was massaged and compressed to check hemorrhage. The peritoneal cavity was cleansed of liquor amnii and blood by raising the patient up, and the abdomen was closed by means of pins and figure of eight sutures. The wound was dressed

with a paste of crushed herbs. The wound healed in eleven days, and the convalescence was only slightly febrile, the temperature not exceeding 101° F. throughout the whole puerperium. Such a well developed technic suggests that the operation had been under development for a long time, and it seems very possible that cesarean section may have been practised among certain barbaric races with success, perhaps for centuries, although among civilized surgeons it remained an operation of the greatest danger, only to be attempted as a last resort after the failure of every other known expedient to accomplish delivery.

The authentic history of cesarean section may be said to cover four periods, the first extending from the earliest times to the beginning of the sixteenth century; the second from the year 1500 to 1876, when Porro published his method of amputation of the uterus following cesarean section; the third period begins with the year 1876 and extends to 1907, and includes the period of development of the so-called conservative or classical cesarean operation; and the fourth period, from 1907 to date, covers the development of the extraperitoneal operation in cases not considered suitable for the classical conservative cesarean.

FIRST PERIOD: *previous to 1500.*—During this period the operation was occasionally performed on women who had died during the latter part of pregnancy, in the hope of obtaining a living child. There is no evidence to warrant the belief that the operation was performed on living women during this time, at least in European races, and it seems hardly possible that so radical a procedure should have been undertaken and leave no trace in the writings of the times. Several authorities believe that certain passages in the Talmud may be so interpreted as to point to its performance on the living amongst the Jews, but the evidence is, to say the least, unconvincing and lacking in authority.

SECOND PERIOD: *1500 to 1876.*—The second period extends from 1500 to 1876. During this time the operation was occasionally performed on the living as an operation of last resort when all other means of delivery had been tried and failed, and the results, as would naturally be expected in the light of our modern experience, were so appalling that the operation was looked on as almost sure to be fatal, until in 1876 Porro described his operation, which altered the prognosis very materially for the better.

Caspar Bauhin (1588) states that the first cesarean section upon a living woman was performed in 1500, when Jacob Nufer, a castrator of pigs at Sigerhausen, Switzerland, operated successfully upon his own wife, after a dozen midwives and several barbers had failed to deliver her, and had given up the task as hopeless. Inasmuch as the patient

not only survived but subsequently had five spontaneous labors, it is fair to infer that the operation was not a true cesarean section, but probably the removal of an extra-uterine child from the abdominal cavity.

François Rousset, in 1581, wrote a monograph on the subject, in which he gave the histories of fifteen cesarean operations collected from various sources. Several of these cases were not authentic, and it seems probable that the majority, if not all, of the others were operations for advanced extra-uterine pregnancy. In spite of the fact that few of these cases were true cesarean sections, this treatise had one great merit, in that it brought the operation to the attention of the medical profession and suggested the possibility of its performance on the living woman.

The first generally accepted cesarean section was performed in 1610, by Trautmann of Wittenberg, on a woman with hernia of the gravid uterus. From this time on, the operation was performed from time to time on patients in whom delivery seemed hopeless, after repeated attempts had been made by other methods and had failed. In spite of the frightful mortality which attended the operation and which aroused the opposition of many of the leading obstetricians of Europe, the operation gradually gained a foothold and was accepted as a justifiable procedure in the hopeless cases where other methods had failed and the only alternatives were cesarean section or permitting the patient to die undelivered. The attitude of the Catholic Church in favoring the operation, because it gave an opportunity for baptism of the child, had much to do with the development of the operation, and the operation was performed with increasing frequency, although the results continued to be so bad that it remained an operation of last resort, only to be undertaken after failure to effect pelvic delivery by all known methods, or in the rare cases when it was evident that such a degree of pelvic obstruction existed as to render attempts at delivery per vaginam utterly hopeless.

During this period the technic of the operation was exceedingly crude, which, together with the fact that the operation was only performed on women who would today be considered bad, if not unjustifiable, operative risks, unless a subsequent hysterectomy were performed, naturally gave bad results. The abdominal wall and uterus were incised and the child and placenta extracted. The contraction and retraction of the uterine walls were relied on to control hemorrhage, the uterine incision not being sutured, and the uterus was dropped back into the abdominal cavity to act as a persistent source of hemorrhage and peritoneal infection. Sutures were first used by Lebas in 1769, but did not come into general use until Säger published his article describing his technic in 1882. The majority of the women died of hemorrhage or infection, and the statistics of the

operation were so bad that in 1777 it was almost entirely superseded by symphyseotomy, only to be rehabilitated at a later date when symphysiotomy fell into disrepute on account of the bad results which attended its performance. Few, if any, operations have passed through such a discouraging early stage, to become acknowledged as among the greatest life saving procedures of modern surgery.

Kayser (Copenhagen, 1844) found a mortality of 62 per cent. for the previous eighty years. Murphy (London, 1862) reported 86 per cent mortality in Great Britain. Meyer (1867) collected 1605 cases from the literature with a mortality of 54 per cent. Budin (1876) states that not a single successful cesarean section was performed in Paris between the years 1787 and 1876, and Späth (1877) reported a similar condition in Vienna. Harris (1878) reported that of eighty cases operated on in the United States up to that time, 52.5 per cent died.

Such results would cause the permanent abandonment of most operations, and it was only due to the fact that an abdominal delivery gave the only possible chance for life to a certain number of unfortunate women, that the operation was not permanently discarded. Such poor results were obtained when the operation was performed by surgeons that Harris pointed out that the patient's chances of recovery were better when the patient, unable to endure longer the pain of labor, performed the operation on herself, or when the abdomen was ripped open by the horn of an infuriated bull; and he collected nine such cases from the literature, with five recoveries, in contrast to eleven cesarean sections performed in the City of New York during the same period, with one recovery.

THIRD PERIOD: 1876 to 1907.—The third period began with the year 1876, when Porro of Pavia, recognizing that the greatest risks to the patient arose from hemorrhage from the open vessels of the uterine walls and from the escape of infected lochia into the peritoneal cavity, advised amputation of the body of the uterus and fixation of the stump in the lower angle of the abdominal wound, in order to lessen the dangers of hemorrhage and infection, which arose from returning the unsutured, usually infected uterus to the abdominal cavity.

This procedure was followed by such an improvement in the results of operation that it soon became very popular, and in 1890 Harris collected 264 operations from the literature. Amputation of the pregnant uterus had been done on a case complicated by multiple fibroids of the uterus by Storer of Boston in 1868, or eight years before Porro described his operation. The result in this case was fatal and the operator did not apparently realize the importance of the innovation as applied to cases of uncomplicated cesarean section, and, therefore, the credit for

bringing it to the attention of the medical world as a possible life saving procedure belongs to Porro, although he was not the first to perform the operation.

Sänger, in 1882, revolutionized the operation and paved the way for its modern development by calling attention to the importance of closing the uterine incision by suture, instead of dropping the unsutured organ back into the abdomen, to be a source of danger to the patient, or removing it and thus rendering her sterile. Since Sängers operation led to the preservation of the uterus, it has been designated as the conservative, in contradistinction to the Porro, or radical, cesarean section and it is still the operation most commonly performed in general practice, although the improvement in results, following the development of the low incision, limited to the non-contractile lower uterine segment and upper cervix, has led to the practical abandonment of the classical operation except in selected cases, in favor of an operation of the Beck or Kerr type in which the child is delivered through an incision in the lower uterine segment, either longitudinal or transverse.

The Porro operation has been modified as the technic of gynecological operations has been improved, and the original operation, as described by him, is now seldom performed. At the present time the common technic employed in cases of supravaginal amputation of the non-pregnant uterus has been substituted for the operation as described by Porro. The uterus is amputated as formerly, but the cervical stump, instead of being fixed in the lower end of the abdominal incision, is covered by a flap of peritoneum and dropped back into the abdominal cavity and the abdominal wound is closed. This method gives equally good immediate results and a much improved ultimate result, the long period of suppuration, which was inevitable under the original Porro technic, being done away with.

In a small number of cases, particularly when pregnancy is complicated by operable carcinoma of the cervix, a panhysterectomy is performed, the entire uterus, including the cervix, being removed. This operation was first attempted by Bischoff, and for a time was freely performed as an improvement over supravaginal amputation. The somewhat increased mortality which attends its use has led, however, to its practical abandonment, except in the comparatively rare cases of operable carcinoma complicating advanced pregnancy, although it is still occasionally advocated in cases of frank uterine infection. It is probable in these cases, however, that the immediate mortality consequent on the more severe operative procedure will more than compensate for the occasional life saved by the removal of the infected cervix.

FOURTH PERIOD: 1907 to date.—The fourth period began in 1907, when Frank of Cologne, who had become dissatisfied with the results of the conservative cesarean section when performed on women frankly infected prior to the operation, or in doubtful cases in which proper asepsis had not been observed during labor, although infection was not definitely demonstrable, reported thirteen cases on whom he had operated by a new method.

In Frank's operation a transverse incision was made through the lower abdominal wall, two or three inches above the symphysis down to the peritoneum. After the recti muscles were severed, the peritoneum was separated from the bladder and anterior surface of the uterus by gauze dissection, until enough of the lower uterine segment was exposed to permit of a sufficiently large incision for the extraction of the child. The placenta was then removed and the uterine and abdominal incisions closed. By this method, under ideal conditions, the whole operation can be performed extraperitoneally and the danger of peritoneal infection, which is very great in doubtful cases on whom the cesarean section is performed, is distinctly lessened. It must be said, however, that Frank's claim that the operation is safe, when the conservative operation is absolutely contra-indicated, has not stood the test of time, and that the results of the operation have not been as universally successful as he predicted, as is shown by the fact that the operation has been variously modified, more than twenty different procedures to obtain the same result having been published in the twenty years since the operation was first described by him.

Available statistics would seem to show that in uninfected cases the conservative cesarean is at least as good an operation for both mother and child, since the difficulty of technic and the increased time required for the extraperitoneal operation render it relatively unsatisfactory for clean cases. Furthermore, even in frankly infected cases, it is yet to be proved that extraperitoneal section gives better results than delivery of the uterus from the abdomen before opening, followed by partial or total hysterectomy, in spite of the increase in operative shock in the latter operation. The only advantage lies in the preservation of the uterus for future childbearing, and in frankly infected cases this is more than made up for by the mortality from puerperal infection due to the retention of the infected uterus. It is, therefore, in the cases in which infection is suspected, but not proven, that the operation is indicated, and not in either the clean or definitely infected cases, it being unnecessary in the former group and inadequate in the latter.

Frank's operation was enthusiastically received in Germany, but its

early promise was not fulfilled. It was found in many cases, either that the peritoneum could not be separated from the underlying organs, or that it was torn during the attempt at separation, thus nullifying the supposed advantage of the operation from not opening the peritoneal cavity. In other cases the bladder was injured or extensive suppuration of the pelvic connective tissue resulted, so that the morbidity was high, and the mortality, while less than that obtained when the conservative operation was performed on infected cases and the uterus dropped back to act as a source of infection to the peritoneal cavity, was no lower than, if as low as, that obtained by hysterectomy.

Not satisfied with this showing, Latzko, Sellheim and other operators modified the operation, converting the so-called suprasymphyseal, extra-peritoneal operation into a suprasymphyseal transperitoneal cesarean section. In this operation the abdomen is opened by a transverse incision and the uterus exposed, after which a transverse incision is made in the peritoneal covering of the uterus just above the reflexion over the bladder, extending to the insertions of the round ligaments on either side. The peritoneal flap is dissected up for a short distance from the anterior uterine wall and is then tightly sutured to the margins of the parietal peritoneum. The lower uterine segment is now freely exposed and is isolated completely from the peritoneal cavity, thus reducing to a minimum the danger of peritoneal infection. The bladder is now freed by blunt dissection from its attachments to the lower uterine segment, the latter is opened by a transverse incision, the child and placenta extracted, and the wounds are closed.

The results of these attempts to modify Frank's operation proved only partially satisfactory, and Döderlein attempted to revive the operation of laparo-elytrotomy, which had been first suggested in 1823, but had not been favorably received at that time, although it had been rehabilitated by Gaillard Thomas in 1871, only to be abandoned in favor of the classical cesarean section. In this operation a long oblique incision parallel to Poupart's ligament gives access to the pelvic connective tissue and the lateral aspect of the lower uterine segment, which is then incised, and the child extracted by forceps. Döderlein reported thirty-two cases in 1911 on whom he had performed this operation, but has discarded it since that time on account of certain very obvious disadvantages. Even in clean cases the healing of the wound proved complicated, and drainage was always necessary. In infected cases the almost sure infection of the pelvic connective tissue rendered a prolonged suppurative process inevitable and the patient only recovered, if at all, after a long, tedious

convalescence. The operation thus proved of no value in the very class of case for which it was primarily recommended.

Krönig was not satisfied with any of these modifications and claimed that their principal advantage lay, not in avoiding the peritoneal cavity, but in the fact that the uterine incision was in the thin lower segment, instead of in the thick contractile portion of the uterus. In the operation, as described by him, the abdomen is opened either by a longitudinal or transverse incision. The visceral peritoneum is then incised at the vesico-uterine reflexion, and the bladder is freely separated from the lower uterine segment. After the lower uterine segment is freely exposed, it is opened by means of a longitudinal median incision, and the child is extracted by forceps. The placenta is then removed and the uterine incision closed. The operation is completed by drawing the bladder back into place, and its peritoneal covering is sutured to the flap dissected up from the uterus in such a manner as to bury completely the entire uterine incision, under a double layer of peritoneum. At first this operation seemed to hold out a greater promise of success than any previous operations, but subsequent experience has proved that the results in clean cases are no better than those obtained by simpler procedures, while in definitely infected cases hysterectomy gives distinctly better results. Its employment then would seem to be limited to the doubtful risks, i.e., patients in labor for a considerable time with or without ruptured membranes with repeated vaginal examinations who are not definitely considered septic, and our present experience leads us to believe that even in this group the low incision gives equally good results and is a more satisfactory operation owing to the greater care of its performance, and the fact that it can be used repeatedly in subsequent pregnancies, a fact which is not true of the Küstner operation owing to the adhesions which result from it.

At the present time some authors, Danforth, DeLee, and others, are urging the abandonment of the classical section in favor of a low cervical, even in clean cases, and claim improved results, at least in the comfort of the patient. It is still too early to pass final judgment on the justice of these claims. A considerable experience with the classical operation, covering a period of many years, performed on healthy women under ideal conditions, has given very satisfactory results. In the same class of cases the low cervical operation gives equally good results and I must admit that the convalescence is more comfortable owing to the fact that intestinal distention seems to be reduced to a minimum. In patients of the doubtful group there would seem to be little question but that the mortality is reduced in the modern type of operation, but a considerable

morbidity occurs though probably less than with the classical operation in similar cases. The results of any operation on unfit patients must be relatively unsatisfactory, to say the least, but it is probable that cesarean section by one of the low cervical methods will prove the most satisfactory operation on all patients whose powers of resistance are below par from any cause, even though no infection is present. It must be admitted, even by the most ardent advocates of the low cervical operation, that when operative speed is a prime object, as for instance in patients with profuse bleeding, or when the child is known to be in a precarious condition, the conservative operation is preferable, as it involves much less loss of time, a factor which is of great importance under these conditions. Furthermore when the placenta is known or believed to be situated in the lower uterine segment the classical operation is still the operation of election.

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CHAPTER II

INDICATIONS FOR CESAREAN SECTION

Cesarean Section Originally an Operation of Last Resort—Results Better, the Earlier in Labor it is Performed—A Much Abused Procedure—Not Without Danger—Bad Results if Performed on Improper Cases—Indicated Only in Cases in Which Pelvic Delivery is Dangerous—Indications in Pre-aseptic Days—Increased Safety Under Modern Conditions—Modern Indications—Results Not Ideal Under Best Conditions—Indications—Pelvic Contraction—Absolute and Relative Indications—Examination of the Pelvis in Doubtful Cases—Palpation of Pelvic Cavity Under Anesthesia—Estimation of Fetal Head—Probable Character of Labor—Dilatation of Cervix—Molding Power of Fetal Head—Modified Trial of Labor in Doubtful Cases—Probable Effect of Labor on the Patient in Cases of Contracted Pelvis—Cardiac Conditions Complicating Labor in Contracted Pelvis—Pelves with a True Conjugate of 9 cm. or Over—Contraction of the Pelvic Outlet—Bibliography.

As was stated in the preceding chapter, cesarean section was originally employed only as an operation of last resort when no other means of delivery was possible, and was seldom or never resorted to, except in cases in which pelvic delivery had been repeatedly attempted and it was felt that the only hope of saving the patient lay in cesarean section. The results were exceedingly bad. With the advent of aseptic surgery and the modification of the technic of the operation by Säger, the results, even in apparently desperate cases, showed a marked improvement, especially in the class of case in which delivery of the living child was recognized as impossible comparatively early in labor, and the operation was therefore undertaken before the patient was exhausted by prolonged labor or infected by repeated manipulation. The increased success which has attended the performance of cesarean section as an operation of election, instead of as an operation of last resort, has led to its employment in many cases, to the exclusion of methods of delivery better suited to the needs of the given patient, until at the present time it is the most abused obstetric operation, being performed by comparatively untrained surgeons on patients who present no real indication for it, under conditions which render it an exceedingly dangerous procedure. It is not at all unusual at the present time to see patients who have been subjected to cesarean section for no apparent reason, as far as physical examination shows, and the only logical conclusion seems to be that the operative indication has been a slow, though normal, labor, which the

attendant has hastened to end in the manner easiest for himself, though often not best for the patient. The increasing safety of abdominal surgery, as modern asepsis has developed, combined with the fact that the operation is much easier to perform than any but the easiest obstetric operations, has caused a loss of perspective, and today there is no question but that cesarean section is one of the most abused operations in surgery.

There seems to be an impression in the minds, both of the general medical and lay public, that cesarean section is a perfectly simple, safe operation which can always be guaranteed to give perfect results under all circumstances. The fact that abdominal surgery always carries with it a certain risk to the life of the patient, even in the most competent hands and under the best conditions, is entirely lost sight of, with the result that, instead of being chosen after careful consideration as being the safest and best method of delivery for the given patient, cesarean section is looked on by many poorly trained obstetricians and general surgeons, who do not pretend to have even a working knowledge of the fundamental principles of the obstetric art, as a panacea for all obstetric ills, and the lives of many women are sacrificed every year on account of this disregard for the interests of the patient, which results in the performance of many operations absolutely unjustifiable.

A careful investigation of the results of cesarean section in several small communities has convinced me that cesarean section, as performed by the local operators in small communities for the indications furnished by the local practitioner of obstetrics, is one of the most fatal of surgical operations. Even in the best hands under good surgical conditions, an occasional patient, who has not been in labor for more than a few hours and who has never been subjected to a vaginal examination, will become infected and die of peritonitis, infection apparently taking place in the uterine wound by extension from the vagina, a danger which can never be entirely eliminated no matter what precautions may be taken to minimize it, such as attempted sterilization of the vagina by iodine, mercurochrome or other sterilizing agents. When, however, the operation is performed late in labor, after many vaginal examinations, or after attempted vaginal delivery, the results, as would be expected, are much worse, and the operation should only be considered, under such circumstances, when no other means of delivery seems to be possible with due regard to the interests of both patients, although in doubtful cases the interests of the mother should be given precedence. It is, however, very common to hear of patients who have been subjected to operation after the ordinary obstetric operations have failed, and the wonder is

not that so many women die, but that any recover when operation is undertaken on unfavorable cases.

Presumably the ease with which the operation can be performed is the prime factor in the choice of cesarean section in improper cases, since, as compared with the ordinary obstetric operation, except perhaps an easy low forceps, cesarean section is the easiest method of delivery for the obstetrician and the safest operation for the child. It must be remembered, however, that cesarean section is an abdominal operation and that abdominal surgery is never entirely without danger; and furthermore cesarean section is a distinctly major operation, and for the patient at least it is not a simple procedure. It is then only indicated when, on account of certain conditions which are known to seriously increase the risks of a pelvic delivery to either mother or child, or both, either as regards life or health, a major surgical procedure is believed to be the safest method of delivery, and the risks which attend its performance have been carefully estimated and given due weight in the decision.

In the pre-antiseptic days cesarean section was considered so dangerous an operation that it was believed to be indicated only in cases in which the delivery of even a mutilated child was considered impossible.

Murphy, writing in 1862, gives the following indications for the operation:

(1) In the ovate deformity of the pelvis when the conjugate axis is less than two inches (rachitis).

(2) In the cordiform distortion from mollities ossium, when the distortion is extreme and craniotomy is either impracticable or so difficult that the safety of the mother cannot be secured (osteomalacia).

(3) When tumors are immovable and so occupy the pelvic cavity as to leave a space of only two inches between the tumor and the pelvis.

If these indications were followed at the present time, few cesarean sections would be performed, but I believe that the maternal death rate would be little, if any, higher than it is at present with the abuse of cesarean section which exists, although the fetal death rate would be much higher.

The development of the aseptic technic in surgery has made it possible to consider the rights of the child as well as the rights of the mother, and the position of cesarean section in modern obstetrics is due to the fact that, under proper conditions and in the hands of a competent operator, the risk attached to it is little greater than that of any other abdominal operation. It is, when performed as an operation of election, a justifiable procedure whenever a thorough examination demonstrates the fact that the child will be subjected to serious danger in case an at-

tempt at pelvic delivery is made, or that the health of the mother is likely to suffer sufficiently seriously from a pelvic delivery to warrant the somewhat increased risk that attends an abdominal delivery.

The modern indications for cesarean section, therefore, may be said to include all conditions which so complicate labor as to seriously threaten the life or health of either patient, and although the operation cannot be said to be without some risk to the maternal life, the risk is a comparatively small one under proper conditions and may properly be assumed for the sake of real advantage for either mother or child, though not for the convenience of the attendant or on account of the fact that he is not properly qualified to care for a situation which can be more safely dealt with by some other method by a trained obstetric surgeon, unless it is impossible to procure the services of a thoroughly qualified operator.

The results obtained by cesarean section, performed at the time of election (i.e., before labor begins, or early in labor), are so much better than the results of the secondary or late operations that it is evident that every patient should be carefully studied during the last month of pregnancy, in order that no indication which may properly call for cesarean section may be overlooked; so that, if the operation seems indicated, it may be performed at the time when the best results may be expected for both patients. In general practice this precaution is usually overlooked, and it is safe to say that the majority of cesarean operations are performed at a time when the dangers of the operation have been much increased, either by a long test of labor, especially if accompanied by early rupture of the membranes, by repeated vaginal examinations often conducted under doubtful asepsis, or by ineffectual attempts at pelvic delivery. It may be urged that the general practitioner is not qualified to determine the necessity of the elective operation, a fact which is undoubtedly true in most cases, since he has not been afforded the opportunity to acquire the special knowledge on which such a decision must be based; but that is no excuse, since it would ordinarily be a simple matter for him to refer every primipara, and every multipara, whose previous obstetric history is questionable, to a well trained obstetrician for an opinion as to the proper method of delivery.

That the results of cesarean section are not ideal, even in competent hands, may be assumed from the statement made by Holmes several years ago, to the effect that any surgeon whose results showed a maternal mortality of more than five per cent should revise the indications for which he operates and should subject his operative technic to the closest scrutiny, since the occurrence of so high a mortality proved either that

he was operating on patients who were not in proper condition for cesarean section, or that his aseptic technic was inadequate. The statistics published by men of unquestioned operative ability and of good obstetric judgment show that the operation is attended by a mortality of from 2 to 4 per cent in all types of patients who are subjected to the operation, although several operators can show a series of 100 or more consecutive cases without mortality. A fatal result in a healthy patient operated on under good conditions should be extremely rare, but the recognition of the benefits of cesarean section to a large class of women who are relatively unfit for childbearing for various reasons, or in whom serious complications are present which are sure to give a certain proportion of bad results, no matter how they are cared for, has resulted in the wide adoption of cesarean section as an operation for the delivery of the unfit, and naturally surgery on the unfit carries with it a relatively high mortality.

Cesarean section is indicated, in the first place, in patients in whom some pelvic obstruction exists, which renders delivery per vaginam, even of a dead and mutilated child, either impossible or so dangerous that an abdominal delivery is attended by no greater risks for the mother than a pelvic delivery. This is admittedly the only absolute indication for the operation, and the operator who performs cesarean operations for other reasons must be sure that the benefits which are to be expected from the operation for either mother or child are sufficient to warrant a certain increase in the risk to the maternal life over what is to be expected following a pelvic delivery. The comparative safety of abdominal delivery in properly selected cases has led to its adoption in cases in which the delivery of a living child by the pelvic route is so open to question that it is considered proper to add somewhat to the maternal risk for the sake of guaranteeing the birth of a living child; but the operation is not a proper one when there seems to be a serious question that the preservation of the fetal life will be attended by a greatly increased maternal risk.

There is furthermore in all of our great centers of population a very considerable class of women for whom childbearing results in serious injury to health and sometimes in loss of life. Examination of these patients shows that there is no pelvic obstruction and, therefore, normal delivery is possible, but the results of pelvic delivery are such that the patient never entirely recovers from its effects and always remains more or less seriously invalided. Experience has shown that in many of these subnormal women delivery by cesarean section is a health saving, if not a life saving procedure, and although the results of major

surgery in women of this type will never be as good as is to be expected among women in good condition, none the less the health of many women will be preserved, leaving them useful citizens in the community; at the expense of a relatively slight increase in the immediate mortality of childbirth.

These three indications, the preservation of maternal life and health and of fetal life, constitute the only justifiable indications for the operation, but many operators perform cesarean section at the present time when by no possibility can either mother or child derive any benefit from the operation, the true indication being the inability of the attendant to select the proper method of treatment for the given patient, or his ignorance of the fact that cesarean section is not a panacea for all obstetric ills.

The great majority of cesarean sections are indicated when some disproportion exists between the size of the fetal head and the maternal pelvis, which either renders the birth of a living child impossible or so dangerous that abdominal delivery is the safer method for one or both patients. Statistics show that, of women with contracted pelves, eight out of ten can be delivered successfully, if allowed to go into labor and then delivered by a pelvic operation, and the figures on which this statement is based include the impossible as well as the doubtful pelves. It is, however, impossible to predict from the size of the pelvis alone whether labor will be possible or not, for of two women with identical pelvic measurements, one may have a spontaneous delivery, whereas the other may need a radical operation for delivery, even though the children may be of approximately the same size. Although the study of the pelvis does not give the absolute certainty to be wished for in regard to the outcome of labor, none the less the information to be obtained from pelvic mensuration is of sufficient value to warrant its performance on every patient, combined with a careful comparison of the child with the pelvic canal, the latter being of the utmost importance, since it must be remembered that disproportion between child and pelvis is more important than the size of either alone, and that pelvic measurements are of little value except in extreme cases, unless taken into consideration with the other factors involved in delivery.

Since, in the discussion of any problem, it is necessary to have a starting point, even though conclusions based on a single factor may have to be modified, it is customary to initiate the study of the indications for cesarean section by a consideration of the pelvis, for the reason that in most cases the size of the pelvic canal has a distinct bearing on the wisdom of allowing a patient to attempt labor.

Pelvic Contraction.—The most common indication for cesarean section is afforded by the existence of disproportion between the fetal head and the maternal pelvis to such a degree as to offer a serious mechanical obstacle to delivery. In the great majority of cases contraction or deformity of the pelvis is the principal factor in rendering labor unduly difficult, but it must be remembered that it is no more difficult for an undersized child to pass through a contracted pelvis than for an over large child to pass through a normal pelvis. Pelvic contraction, therefore, is not the only factor to be considered in estimating the probable course of labor, and the relation of the given child to the given pelvis must also enter into the calculation. The methods of determining

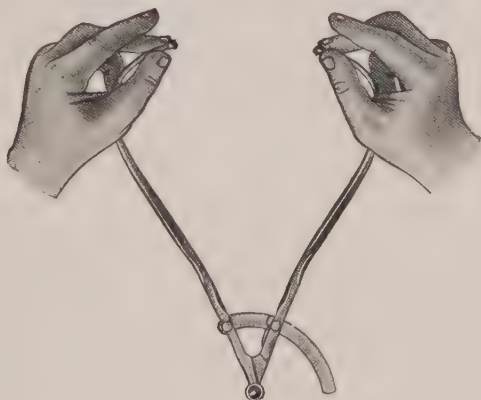


FIG. 1.—PELVIMETER.

the relation of the child's head to the pelvic canal will be discussed later.

The pelvic indication for cesarean section may be either absolute or relative.

(I) **ABSOLUTE INDICATION.**—It is universally agreed that whenever the true conjugate diameter measures 5 centimeters (two inches) or less, cesarean section is absolutely indicated to accomplish delivery, no matter what the condition of the patient may be, without regard to the length of time she may have been in labor or the possible presence of uterine infection. This is due to the fact that in such an extreme degree of pelvic contraction the delivery of a normally developed or even of a rather small child is practically impossible, even after embryotomy, and an abdominal delivery, therefore, offers the only chance of saving either the maternal or fetal life and is called for in all cases. This is practically the same indication that obtained in the early days of the operation, when the maternal mortality resulting from cesarean

section was so high that the prognosis of the operation was nearly hopeless.

(2) RELATIVE INDICATION.—In a pelvis with a true conjugate diameter measuring between 5 and $7\frac{1}{2}$ centimeters (two to three inches) the delivery of a living, average sized child is practically impossible, but it is usually possible to deliver a child on whom craniotomy has been performed, without undue risk to the mother, unless the child is over

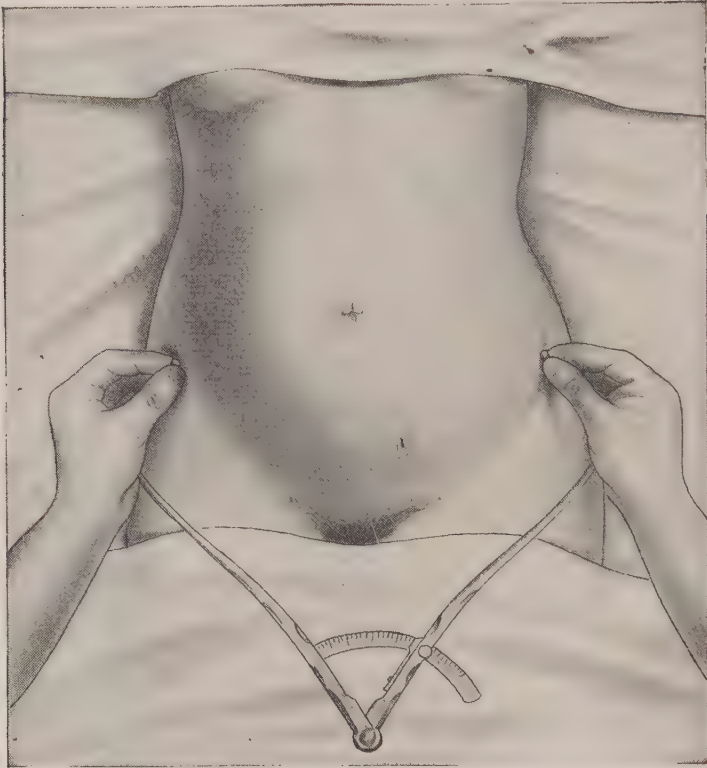


FIG. 2.—MEASURING DISTANCE BETWEEN ANTERIOR SUPERIOR SPINES.

large. Therefore, in patients in whom a pelvic contraction within these limits is recognized, as it should be, during pregnancy or very early in labor, cesarean section at term is the elective method of delivery in all cases in which the child is alive and in good condition. If, however, at the time when the pelvic contraction is recognized the patient has been in labor a long time and is showing signs of exhaustion, or has by repeated manipulations been seriously exposed to infection, the prognosis of the conservative cesarean operation is sufficiently doubtful

to indicate either a low cervical operation or cesarean section followed by supravaginal amputation of the uterus, according to the urgency of the symptoms and the judgment of the surgeon, hysterectomy being usually the preferable operation in cases of frank infection. If the child is dead, or in anything but good condition, craniotomy is the operation of election in cases of this type, since abdominal section on a patient late in labor and possibly infected is never justifiable, except in the inter-

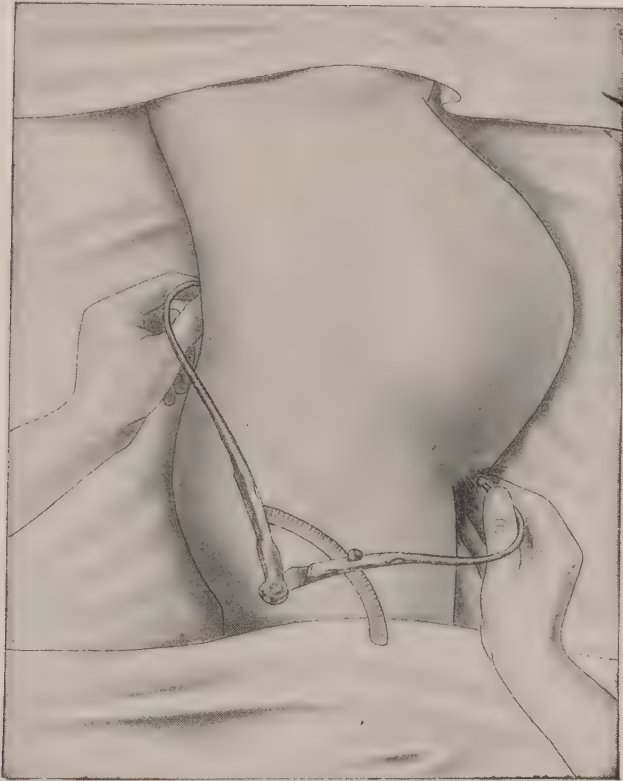


FIG. 3.—MEASURING EXTERNAL CONJUGATE DIAMETER.

ests of the child, when any other method of delivery is possible, and craniotomy should not be refused in such a case for purely esthetic reasons under conditions which render it the safest method of treatment for the mother. In other words, the interests of the child may occasionally afford sufficient indication to render a serious risk to the mother justifiable, but unless it seems practically certain that the life of the child can be guaranteed by running grave risks for the mother, her interests alone should be considered, unless, with a full understanding of the danger to herself, she insists that the child be given every chance.

EXTENSION OF INDICATIONS.—The excellent results of cesarean section at the time of election under modern conditions, and the fact that delivery of an average sized, full term child, except after craniotomy, is so difficult as to be practically as dangerous as cesarean section in a pelvis with a true conjugate diameter of less than 7.5 centimeters, have had a potent influence in modifying obstetric opinion in favor of more liberal views toward pelvic contraction as an indication for cesarean section, with the result that the upper limit of the absolute indication has been raised to 7.5 centimeters when the conditions which predispose to a

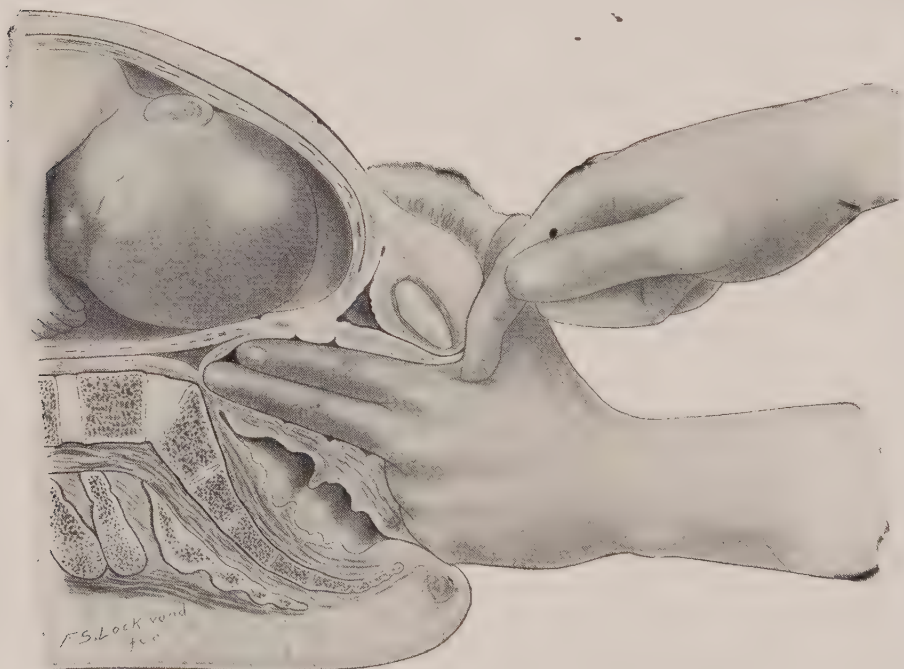


FIG 4.—MEASURING DIAGONAL CONJUGATE DIAMETER.

successful result are fulfilled. These are: (1) The child must be alive and in good condition. (2) The patient must be in good condition and her chances must not have been compromised by the exhaustion of a long labor, by repeated vaginal examinations, or by previous attempts at pelvic delivery. In addition the membranes must not have been ruptured for more than a few hours. (3) The patient must be under proper conditions to warrant the performance of a major operation, i.e., either in a properly equipped hospital or in a home where hospital conditions can be reproduced. She must be able also to command the services of a properly equipped surgeon, and efficient after care must be provided for. If any of these conditions cannot be fulfilled, a pelvic operation

offers a so much better chance for the mother that it should be selected, even though it may involve the loss of the child.

In cases in which the degree of pelvic contraction is less marked, in which the true conjugate diameter measures between 7.5 and 8.5 centimeters in flat, and 7.5 and 9 centimeters in generally contracted pelves, the operation may be indicated as an elective procedure. In patients whose pelves offer this degree of contraction a satisfactory labor will often result in the delivery of a living child by means of a not too difficult pelvic operation, but it is exceedingly difficult to estimate the course of labor in advance, and many children are lost and mothers seriously injured as the result of attempting a pelvic delivery under such conditions.

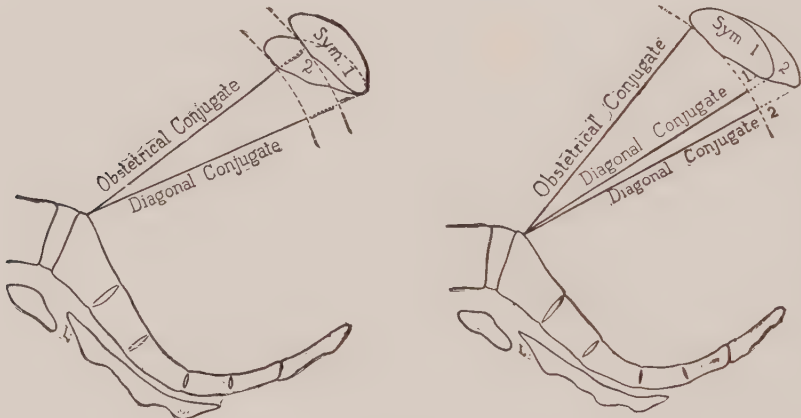


FIG. 5.—MEASURING DIAGONAL CONJUGATE DIAMETER ON THE FINGERS.

A large proportion of the patients in this class will either deliver themselves spontaneously or come to an operative, pelvic delivery of not undue difficulty, and the exercise of the wisest obstetric judgment is called for to determine which case can be safely delivered through the pelvis after a labor of not undue severity for the given patient, and which should be subjected to a radical operation for delivery. In this connection it must not be forgotten that the mere possibility of delivery through the pelvis is not the only factor to be considered, and that the effect of a severe labor on the after life of the given patient, with the chance of more or less serious laceration, must be taken into account. Two women with practically identical pelvic measurements and with children of approximately the same size may have totally different results. One may have a comparatively easy, spontaneous labor, while the other may require

a major operation to insure the safe delivery of a living child and the preservation of her own life or health. In the latter class of patients cesarean section is indicated, partly to save the mother from the almost inevitable damage attendant on a difficult version, high forceps, or craniotomy, and partly to guarantee the life of the child; but it is often impossible to predict with any degree of accuracy in the given patient what the character of her labor will be, and the comparison between the child and pelvis, though of prime importance, is not the only factor in the problem.

A thorough examination of the patient during the last weeks of pregnancy, preferably undertaken under full anesthesia, is obligatory in



FIGS. 6 AND 7.—VARIATION IN DIAGONAL CONJUGATE DIAMETER IN ACCORDANCE WITH HEIGHT AND INCLINATION OF SYMPHYSIS PUBIS.

these cases, together with a careful consideration of all the factors in the individual case. The pelvis should be carefully explored with the half hand, so that no pelvic deformity, which may not be indicated by the ordinary measurements, can be overlooked.

The attempt should be made to impress the head into the pelvis by Müller's method at the same time. If the lowest point of the head can be brought to the lower margin of the symphysis pubis, it can be regarded as practically certain that, if the patient has a labor of ordinary power, the head will be molded into the pelvis, sufficiently at least for the performance of a low or mid forceps delivery of not more than average difficulty, and cesarean section need not be considered unless other indications are present. If, however, the head cannot be fitted into the pelvic brim, and especially if it overrides the symphysis, the case is not so easily settled and other factors must be taken into consideration. If

the degree of overriding is marked, it is fair to assume that the head can only be molded into the brim, if at all, after a long and difficult labor, which will involve considerable danger to the child, and cesarean section at the time of election is the operation of choice for the sake of the child, provided proper facilities can be arranged for. This method of delivery will also save the mother from a severe labor, which may have

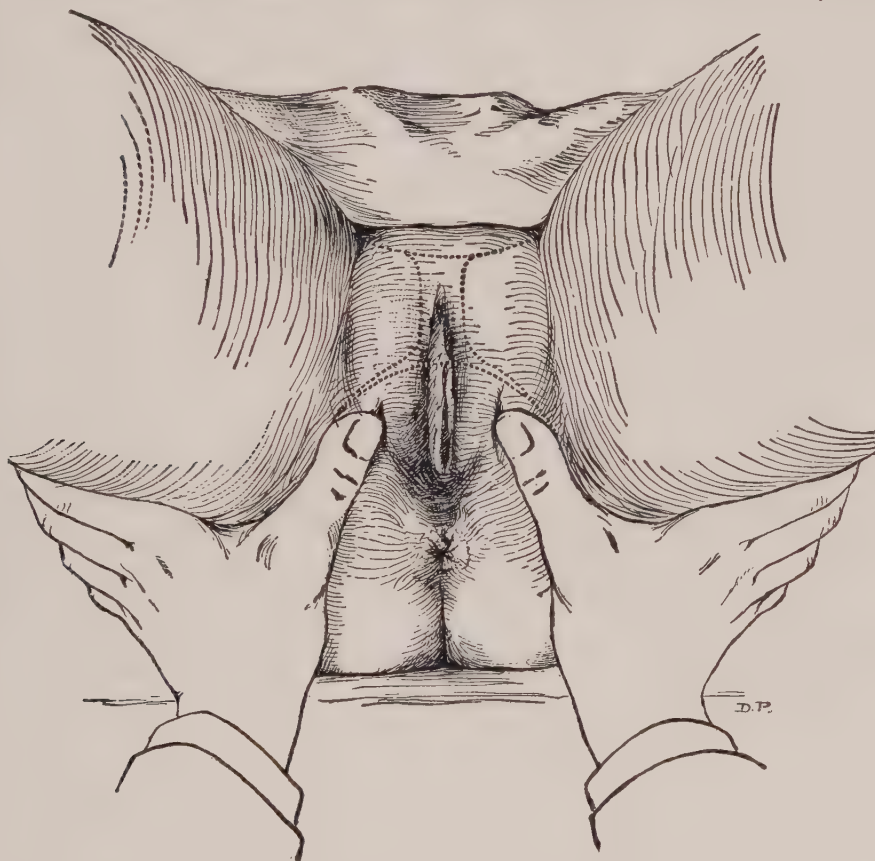


FIG. 8.—PALPATING PUBIC ARCH.

serious after effects on her general health, and unless her nervous and physical equipment is such that no unfortunate consequences need be feared, even though labor may prove to be unusually severe and prolonged, this fact should receive careful consideration.

In cases in which the overriding is slight, or in which no overriding is present, and yet the head cannot be fitted into the pelvis, other factors should be taken into consideration in deciding the problem.

If the patient is a primipara, of an age close to the end of the child-bearing period, an elective cesarean delivery offers an almost sure method

of securing a living child at a minimum of risk to the mother. The immediate risk of life to the mother is slightly greater in abdominal than in pelvic delivery in this type of case, but this is more than compensated for by the increased safety to the child, in addition to the avoidance of serious laceration, with its consequent possible invalidism and probable secondary operation.

If the patient is a multipara who has had previous obstetric disasters, cesarean section should be chosen without hesitation in these border line cases, unless the present child is manifestly smaller than the previous children have been, or the previous disasters can be traced to poor judg-

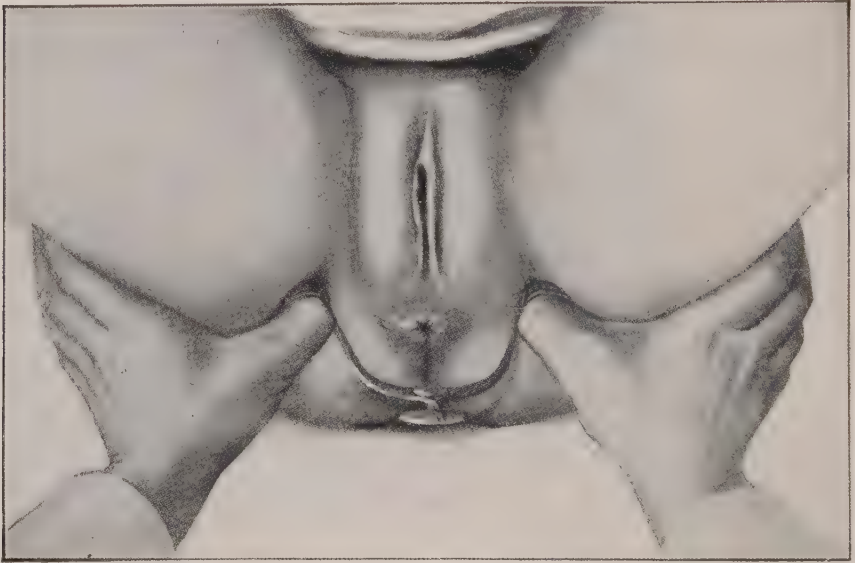


FIG. 9.—MEASURING TRANSVERSE DIAMETER AT OUTLET.

ment or operative technic on the part of the former attendant, and even then the obstetrician must be very sure of his superior ability as an operator before he decides to run the risk of losing another child for such a patient. Many children have been unwarrantably sacrificed, because the physician in charge of the second labor has assumed that his superior training warranted the assumption that he could succeed where his predecessor had failed, and he has thus been led into the error of not profiting by his patient's previous history and has sacrificed her interests to his own conceit. It is fair to say that, if a patient with a border line pelvis has lost one child as a result of a difficult operative delivery, cesarean section in succeeding pregnancies is advisable, and that, if she has lost more than one, the indication is absolute.

The examination should also include a careful estimation of the size of the child's head and comparison of it with the maternal pelvis by the various methods advised for measuring the fetal head, but these procedures, although of distinct value, do not give accurate information as to the outcome of labor, owing to the fact that other factors enter into the problem to a greater or less extent. It is undoubtedly the case



FIG. 10.—MEASUREMENT OF ANTEROPOSTERIOR DIAMETER AT OUTLET
(WILLIAMS' METHOD).

that in expert hands such an examination will reduce the margin of error to a minimum, but the fact remains that the ultimate result in a certain number of cases depends on other factors which cannot be determined until the patient has been in labor for some time. The other factors which must be taken into consideration are: the probable character of the labor, i.e., the strength and frequency of the uterine contractions, the time at which the membranes rupture, whether before or after dilatation of the cervix has been attained; the rigidity of the soft parts, and the molding power of the child's head. In addition, the effect of a hard

labor on the individual patient must be taken into consideration in determining the best method of delivery, since in women who are below the normal standard, either physically or nervously, the exhaustion of a prolonged and severe labor may leave permanent after effects of a more or less serious character, and furthermore, the results of severe laceration may have a very detrimental influence on a patient's after health.

(1) *Probable Character of the Labor.*—In a primipara the character of the labor cannot be surely predicted. As a rule strong, well developed women will have good labors, while frail, anemic women are more likely to have unsatisfactory labors. This rule, however, is by no means absolute, and flabby, anemic women may have satisfactory labors, the uterus developing unlooked for power and the resistance of the soft parts being reduced to a minimum, while in some strong, healthy women the uterine action proves feeble and unsatisfactory from the start.

The nature of the pelvic contraction may, in some cases, give a clue to the probable character of the labor. In patients with rachitic pelves labor is apt to be powerful and satisfactory in character and the same holds true in women with flat pelves, the pelvic contraction being a purely local condition without associated change in the uterine musculature, the latter being normal and capable of developing the necessary power.

In women with generally contracted pelves, due to a lack of proper development, the pelvic organs are also apt to be underdeveloped, and labor will often prove ineffective, owing to a lack of proper muscular development of the uterus, with the result that even a slight pelvic disproportion may afford too great an obstacle to be overcome by the feeble uterine forces.

In other cases, with an apparently normal pelvis, the uterine development may be deficient, as is evidenced by a history of irregular and painful menstruation, suggesting an infantile condition of the uterus. These symptoms are, however, only suggestive and do not afford definite evidence of muscular inefficiency of the uterus; but they deserve some consideration when the adaptation between the head and pelvis is abnormal, and in doubtful cases may very properly be the deciding factor in the selection of the method of delivery most appropriate to the given patient's needs, and result in the choice of cesarean section at the time of election as the wisest method of delivery in the given case, although in doubtful cases a few hours' trial of labor may be given in order to decide the question.

(2) *Dilatability of the Cervix.*—The dilatation of the cervix to the point at which it no longer offers an obstacle to the birth of the child is a sine qua non of successful pelvic delivery. Under normal circum-

stances this is accomplished by the hydrostatic action of the "bag of waters" and in cases of the early rupture of the membranes by the presenting part. As a general rule dilatation is materially delayed by the premature rupture of the membranes, even when the head is well in the pelvis, although in these cases the delay is usually relatively unimportant.

When disproportion exists, however, between the fetal head and the maternal pelvis, early rupture of the membranes assumes a much greater significance. The natural dilator of the cervix is lost, and the presenting part cannot act as a dilator until after the formation of a considerable caput succedaneum, owing to the fact that it cannot come into contact with the cervix until it is molded into the pelvis, which as a rule does not occur, at least completely, until dilatation of the cervix is accomplished. Since the molding of the head is usually accomplished during the second stage of labor, the head is not in the pelvis and thus in contact with the cervix in cases of even moderate disproportion, and progress ceases until the edematous caput is formed to act as a dilator. This loss of time frequently results in such a degree of exhaustion of the mother as to call for prompt operative interference before dilatation of the cervix is accomplished, or the lower uterine segment may become dangerously overdistended, with consequent danger of rupture before proper dilatation of the cervix is accomplished. Early rupture of the membranes should, therefore, be considered as a very definite indication in favor of cesarean section in cases where the method of delivery is doubtful, as in cases in the border line class, and even in cases in which little doubt is felt as to the probability of pelvic delivery, if labor is satisfactory; since the progress of labor is apt to be so seriously interfered with that the cervix may fail of satisfactory dilatation before exhaustion of either the patient or the uterus develops, and the dangers of an operative pelvic delivery greatly increased.

Careful observation of the progress of the case by rectal examination will furnish the best evidence as to what the treatment should be, and if progress is not steady and satisfactory in these cases prompt abdominal delivery is called for. Repeated vaginal examinations to determine progress, though somewhat more satisfactory in some cases than rectal examination, add to the danger of infection to such an extent that in cases in which abdominal delivery is a possibility vaginal examination should be dispensed with whenever possible.

Unsatisfactory dilatation of the cervix and persistently inefficient, irregular uterine contractions should be considered as an indication for cesarean section, even in cases with unruptured membranes, when any

serious doubt exists as to the ability of the head to pass through the pelvic cavity unless markedly molded. Under these circumstances it is extremely doubtful if labor will prove satisfactory at any time, and a delay of any considerable length means either a difficult pelvic operation with considerable danger to both patients, or a late cesarean section with a definite increase in the risk to the mother. There is no advantage to be gained by a long delay in a case of this nature, since four or five hours of labor will furnish an almost certain clue to the ultimate character of labor, and if the uterus fails to function properly within a reasonable time, it is almost sure that labor will not prove efficient in overcoming a serious mechanical obstacle. Cesarean section is, therefore, indicated as soon as the inefficiency of the labor is demonstrated.

In these border line cases the outcome is to a certain extent doubtful, even if labor is satisfactory in character in the beginning, and any departure from the normal should be met by a prompt change in policy, unless the delay already permitted is felt to have seriously increased the risk of abdominal delivery, or unless vaginal examination has been freely practised in the attempt to study progress.

(3) *The Molding Power of the Fetal Head.*—The question as to whether a given fetal head can pass through a given pelvis can in some cases only be answered by a knowledge of the degree of molding which a given head will undergo when subjected to the forces of labor. Unfortunately we cannot predict for the given case, if the patient is a primipara, but must wait for sufficient dilatation of the cervix to permit of palpation of the head before arriving at a decision. In a multipara some information may be gained from the history of previous labors. If the previous children have had large heads with small fontanelles and narrow sutures it is probable that this child will have a similar head and the molding process be slow and difficult, even if it be possible; and unless the first stage of labor is promptly completed, so that the whole power of the unexhausted uterus can be exerted to accomplish molding of the head, the waiting policy should be abandoned and cesarean section performed.

The question can only be definitely answered by palpation of the fetal head through the partly dilated cervix, which means a delay of several hours at the best. If on examination through the partly dilated os it appears that the head is poorly ossified and the sutures and fontanelles are widely open, and the bones of the skull are parchment like to the touch, a marked degree of molding is possible and delivery may be accomplished from below by a not too difficult operation, after it has taken place, if the uterine contractions are of average strength. On the other

hand, if the sutures and fontanelles are nearly closed and the bones are firm and hard, molding is sure to be a long and difficult process and the powers of the patient may fail before it is accomplished to a satisfactory degree, even though the uterine contractions may be of unusual strength. In these cases the proper treatment must depend on the estimation of the patient's ability to undergo a severe labor without serious after effects and on the estimated degree of the force exerted by the uterus. If any real doubt exists in a case of this nature, cesarean section is the operation of choice, and the operation should be undertaken as soon as any real doubt as to the probable outcome arises, since if interference is delayed until failure is absolutely demonstrated, the prognosis of the operation will be seriously changed for the worse for both mother and child.

In the majority of border line cases a few hours' trial of labor will give a strong hint as to the probable outcome, and if labor is conducted aseptically and the progress of the case followed by abdominal palpation and rectal examination, the risk to the mother will be only slightly increased over that of operation at the time of election, i.e., before labor begins, or in the early hours of labor. In fact a certain advantage may be gained by the fact that a moderate amount of cervical dilatation will occur, which theoretically will provide for more satisfactory drainage later and may obviate the necessity for dilatation of the cervix during the convalescence in case a tendency to retention of lochia occurs, although in my experience this is a theoretical advantage only.

Of course the result of labor cannot be accurately predicted in a certain proportion of cases until the patient has had a true test of labor, i.e., two hours or more in the second stage, but a few hours of labor will determine whether the case is likely to progress to a favorable conclusion, except in so far as the ultimate molding of the head is concerned.

If the progress of labor is anything but perfectly satisfactory, cesarean section at once becomes the indicated procedure, provided the patient has not been compromised by repeated vaginal examinations.

If the progress is satisfactory and the cervix is dilating properly, so that it is evident that the head will be subjected to the molding power of the uterus before the patient is exhausted, labor should be permitted to proceed on the understanding that cesarean section will be considered as contraindicated after a thorough test of labor, except in the rare case when, the test of labor having failed to mold the head into the pelvis, some unusual factor calls for the delivery of a living child, even at considerable risk to the mother. Such a condition should be recognized,

however, before labor begins and should call for a primary cesarean section, since whenever the life of the child assumes an unduly great importance, the risks involved in applying a test of labor should not be taken whenever any reasonable doubt exists as to the probable outcome, inasmuch as an elective operation will give better results for both mother and child than a late section or a difficult pelvic delivery.

(4) *Effect of Labor on the Patient.*—In considering the best method of delivery for patients with a moderate pelvic contraction, the effect of a long, hard labor on the patient should be carefully considered. There exist in every large city many women who are, physically or nervously poorly equipped and who will suffer more or less seriously if they are subjected to a serious strain, and may possibly never fully recover. The frail, anemic woman, who has normally just enough strength for the ordinary burdens of life, is usually a poor risk to be subjected to a severe physical strain and may suffer seriously, if not permanently, from the effects of a hard labor. One not infrequently sees patients who have not recovered from the strain of a normal labor for many months, even though the strain was not an unduly severe one. To subject such a patient to a labor which would tax the powers of the strongest woman may mean a long period of invalidism, which could be avoided very properly by an abdominal delivery, since it is a fact that many frail women stand an operation well and show very slight after effects, but recuperate very slowly and imperfectly from severe exhaustion, such as is necessitated by a labor of no more than average severity.

An unstable nervous equilibrium may also furnish a perfectly good indication in these cases. Many women expend their whole nervous energy in the routine of their daily lives and are unfitted to bear any additional strain. Such women not infrequently suffer so severely from the nervous exhaustion incident to a normal labor as to be invalidated more or less seriously for a considerable time, and may never entirely recover from the effects of childbirth, even though no physical lesion can be determined; and many cases of more or less severe nervous breakdown follow labor in patients who have no reserve of nerve force and who are living up to their limits in their daily lives.

If a patient's previous history indicates that her nervous stamina is below par and that any added burden in her ordinary life has been followed by a nervous breakdown, cesarean section should be carefully considered as a conservative procedure, even in patients with normal pelves, unless careful examination shows that owing to the relaxed condition of the soft parts the labor is sure to be an easy one. If a patient of this sort has any pelvic contraction, even of moderate degree, the

method of delivery which adds least to the burdens the patient is staggering under should be chosen, in order to diminish the strain as far as possible. The easiest method for such a patient is undoubtedly cesarean section, and my experience has shown that the results of the operation in patients of this class are much better than those seen after a hard labor, and that a very slight increase in risk is involved.

The pain of labor per se, without taking into consideration the severe muscular exertion, seems to be too much of a burden for many women of this class, and not infrequently creates a permanent impression on the patient, so that the rest of her life is spent in fear of a repetition of the horrors she remembers, a condition which might have been avoided if her needs had been recognized and the strain of labor avoided.

Another type of patients in whom the exhaustion of a severe labor may develop permanent after effects is the class who do not improve in general condition during pregnancy and who come to labor in a poorer general condition than existed before the beginning of pregnancy. The average woman improves markedly in general health during pregnancy, and the patient who does not so improve should cause her attendant serious anxiety as labor approaches. Examination may show nothing to account for the lowered vitality, but the condition is not a normal one. I believe that many of these patients are suffering from a low grade toxemia as a result of which they become unfitted to bear the strain of a severe labor, and if the degree of pelvic contraction is anything but slight, cesarean section offers the best method of delivery.

CARDIAC CONDITIONS.—Patients who show definite heart lesions are seldom, if ever, good risks for any but the easiest of labors, even though no pelvic abnormality exists, particularly patients with mitral stenosis or aortic regurgitation, and the indication is emphasized if there have been attacks of decompensation during or before pregnancy. Cesarean section is always indicated in cardiac cases when any reason exists to expect a difficult labor. This is particularly true on account of the danger of cardiac failure occurring during or shortly after a labor of not more than average severity. The lives of many women have been sacrificed, and many others have been left as cardiac invalids, owing to the mistaken idea that a heart already damaged can be with safety allowed to undergo the severe strain of a labor which may test the reserve of even a normal heart to the utmost.

Another group of patients who should not be subjected to any but the easiest of labors comprises those who, though the heart shows no definite lesion on examination, yet develop dyspnea and tachycardia on the slightest exertion during pregnancy. With them should be included

the patients who are suffering from a presumable myocarditis following acute infection, patients who after a reasonable interval of normal health would probably make a complete recovery, but whose convalescence is retarded by the burden which pregnancy throws on the weakened heart muscle and who show minor cardiac symptoms throughout pregnancy. Such patients are poor risks to be subjected to any avoidable strain, since the heart muscle is flabby and the strain of even an easy labor may result in acute cardiac dilatation, which may prove alarming and possibly fatal. Furthermore the strain thrown on the heart by labor may retard, if not prevent, complete restoration of the heart to a normal condition. In multiparae with relaxed soft parts a short first stage will do little if any harm, but the second stage of labor should be curtailed by operative means. In primiparae with such a cardiac condition labor should be avoided and the patient delivered by cesarean section, even though the pelvis is normal and there is no reason to expect any greater strain on the heart than is inevitable in a normal labor. If any disproportion exists between the child and the pelvis, as in border line cases, the indication for cesarean section becomes an absolute one, since the strain of a labor which will probably be of more than average severity is sure to produce harmful effects on such a heart muscle, and may result in chronic invalidism, if not in death during labor. Acute dilatation of the heart with its attendant dangers will develop in a certain proportion of these cases, if they are subjected to labor, and in others the return of the heart to a normal condition will be retarded, while in some permanent damage will result from the strain, and the heart will never become perfectly normal. Cesarean section is, of course, not without some risk in these patients, but the risk will be only slightly greater than in normal women, unless the heart is showing signs of decompensation at the time of operation. Even then both the immediate and ultimate results will be better than if the patient is allowed to undergo the strain of labor, or is subjected to a difficult operative delivery per vaginam. In these cases cesarean section is the operation of election, not because it can be guaranteed to give perfect results, but because labor followed by an operative delivery is exceedingly dangerous for these patients and cesarean section is the lesser evil.

Pelves with a True Conjugate of More than Nine Centimeters.

—In pelves with only a moderate degree of contraction of the true conjugate diameter cesarean section will comparatively seldom be the operation of election, unless the child is over developed or some other indication than the pelvic one exists.

In a primipara with such a pelvis the attention of the attendant

should be called to the existence of the contraction by the fact that the fetal head does not descend into the pelvic canal in the latter part of pregnancy, rather than by the pelvic measurements. The non-engagement of the fetal head per se calls for a thorough pelvic investigation, preferably under anesthesia, when the extent of the pelvic contraction can be ascertained. If the true conjugate is more than nine centimeters and the child is of no more than average size, radical operation will seldom be called for, although the course of labor should be carefully observed from the beginning and any departures from the normal should be promptly investigated and receive proper treatment. If, however, labor is normal from the beginning, a pelvic delivery is almost certain after a labor of little more than average severity.

If, however, the child is above the average size, cesarean section will often prove the operation of election, since the important factor is the comparison between the child and the pelvis and not the size of either by itself. In doubtful cases a test of labor (as described in the preceding section) should be carried out under full aseptic precautions and the ultimate treatment of the case decided by this test.

In multiparae the history of previous labors, plus the size of the present child, should be the determining factor in the choice of treatment. Women who have lost a child in a previous labor should be delivered by cesarean section, unless the present child is manifestly, distinctly smaller than the previous one, whereas women who have been successfully delivered in previous labors, unless by unduly difficult operations or at the expense of serious injury to the soft parts, should be allowed to go into labor without fear, unless the present child is distinctly larger than the previous children, in which case cesarean section may very properly be indicated.

The presence of any complicating factor, such as cardiac disease, subnormal equipment, etc., will very properly call for a change of policy in regard to patients with a slight degree of pelvic contraction, and cesarean section may be indicated on account of the complicating condition, but the pelvis per se, in cases in this class, will seldom necessitate the operation.

Malpresentations, or malpositions, of the child should have some influence in determining the course of treatment in doubtful cases. It is well recognized that transverse and face presentations occurring in primiparae furnish definite evidence of disproportion between the fetal head and the pelvis. The discovery of such an abnormality in a patient whose pelvis has already been recognized as somewhat contracted may well prove a sufficient indication for cesarean section, since in these

cases a more or less difficult operation is almost surely necessary to effect delivery, and the danger to the child is great, inasmuch as, owing to the malposition, the head will probably be dragged through the pelvis in an unmolded condition, which will add greatly to the danger to the fetal life and the maternal tissues. In multiparae the occurrence of malpositions is less significant, since the soft parts of the mother will offer little resistance to delivery, and the only problem to be determined is the relation of the fetal head to the pelvis.

Contraction of the Pelvic Outlet.—As a rule, in considering pelvic contraction as an indication for cesarean section, attention is directed to the pelvic brim and the outlet receives little or no consideration.

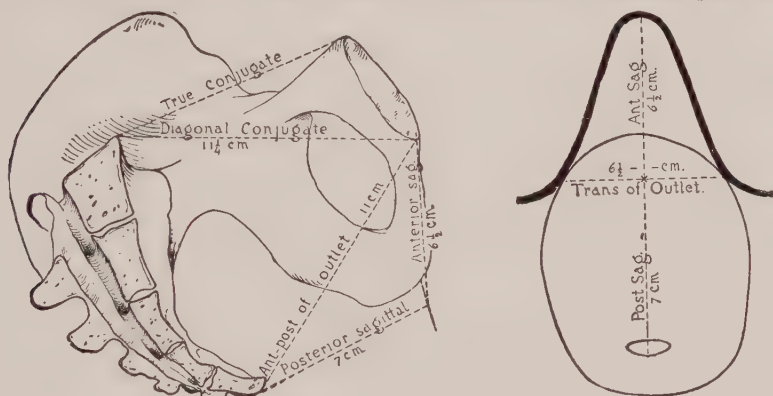


FIGS. 11 AND 12.—IMPORTANCE OF ANTERIOR AND POSTERIOR SAGITTAL DIAMETERS: SPONTANEOUS DELIVERY.

Williams has shown that contraction of the outlet of the pelvis is probably the most common form of contraction met with among white women in this country, and the outlet should therefore always be measured as a routine in studying the pelvis. It is commonly stated that a transverse diameter of 7 centimeters or less is a positive indication for an abdominal delivery. Unfortunately the question cannot be settled as easily as this and further study of this type of pelvic contraction is necessary. As Klien has pointed out, the length of the transverse diameter, neither by itself nor in combination with the anteroposterior diameter of the outlet, furnishes sufficient information for the adoption of a settled policy. Serious dystocia may result in cases in which the degree of contraction is only moderate, and spontaneous delivery may sometimes occur in patients who present extreme degrees of contraction.

This apparent discrepancy is readily explained, however. It is evi-

dent that the shortening of the bisischial diameter is associated with a narrowing of the pubic arch and an approach to the male type of pelvis. As the arch becomes narrowed a smaller segment of the head can pass beneath it, and in the most marked cases the only portion of the pelvic outlet that the head can enter is posterior to the bisischial diameter. In such cases it is evident that delivery will be impossible unless the posterior portion of the outlet is sufficiently enlarged to permit the passage of the head, and that the important diameter is the distance between a line joining the ischial tuberosities and the tip of the sacrum, and not the anteroposterior diameter of the outlet as a whole. This diameter is known as the posterior sagittal diameter of the outlet and can be readily measured by the use of one of the specially devised pelvimeters.



FIGS. 13 AND 14.—IMPORTANCE OF ANTERIOR AND POSTERIOR SAGITTAL DIAMETERS: CESAREAN SECTION.

For spontaneous delivery to occur, the posterior sagittal diameter must increase in length in proportion to the shortening of the bisischial, and it is possible to calculate with fair accuracy the amount of increase necessary to render delivery through the pelvis probable.

Williams gives the following figures, showing approximately the increase in the posterior sagittal diameter necessary to permit the average fetal head to pass the outlet in cases of marked contraction of the transverse diameter:

Transverse diameter	8	cm.;	posterior sagittal	7.5	cm.
"	7	"	"	8	"
"	6.5	"	"	8.5	"
"	6	"	"	9	"
"	5.5	"	"	10	"

It has been stated that delivery of a normal child except by a difficult operative procedure will seldom or never occur in pelvises with contracted outlets unless the sum of the transverse and posterior sagittal diameters totals 15 or more. The figures quoted from Williams bear out this contention.

At the best, however, the pelvic measurements are only one of the factors involved in the question, and it is a not uncommon occurrence for patients with relatively normal measurements to develop serious dystocia, and on the other hand for patients with extremely doubtful measurements to have a spontaneous labor. It is necessary also for other factors to be taken into consideration before deciding on the treatment of the individual patient.

The size of the child must be taken into account, since the measurements given are considered in relation to a child of average size and not to one which is overdeveloped, proper molding of the head being often as necessary for successful passage of the outlet as it is for entrance into the brim. Over large children are apt to have large and well ossified



FIG. 15.—MEASUREMENT OF ANTERIOR AND POSTERIOR SAGITTAL DIAMETERS WITH THOMS' PELVIMETER.

heads, and since, in cases of funnel pelvis, the head is already in the cavity of the pelvis and its size can only be estimated with difficulty, the size of the child as a whole must be taken as a guide to the size of the head.

The depth to which the head enters the pelvis before meeting obstruction furnishes a certain amount of information. If the head remains above the ischial spines and cannot be forced lower, even under anesthesia, the ability of the head to mold through the outlet is at least open to question in marked cases of funnel pelvis. If, however, it is possible to push the head well down onto the pelvic floor before labor is far advanced, it will almost certainly come through the outlet without great difficulty, even in cases of fairly marked contraction.

The position of the fetal head is also of some importance. In cases of posterior position of the occiput the normal rotation to the arch is

apt to be interfered with, and the head not infrequently becomes impacted while still posterior, to such a degree that rotation to the arch, even by means of the Scanzoni maneuver, becomes a matter of considerable difficulty, with a definite increase in danger to the child; then if rotation fails extraction of the child may be impossible or necessitate the use of such force as to cause its death. In such cases a resort to pubiotomy will solve the problem with least danger to mother and child, unless infection has already occurred, but if the operator is not equipped to perform this operation the only alternatives are cesarean section, a brutal forceps extraction, or craniotomy.

Owing to the fact that the anterior portion of the pelvic outlet is not available for the passage of the head, the perineum is subjected to much greater distention than in normal cases and serious lacerations may result. It is evident that a considerable proportion of complete perineal lacerations are inevitable in cases of marked outlet contraction, on account of the backward displacement of the head, if a pelvic delivery is undertaken. This fact should be given some weight in patients who bear pain and discomfort badly, and a cesarean section may very properly be considered in certain cases in which the markedly contracted outlet renders the liability to serious laceration a factor in the case, especially in elderly primiparae, since the patient may well be better off after a cesarean section than after a complete laceration which does not heal properly and requires secondary operation for its relief, and will not be subjected to any appreciable increase in risk.

After Operations for Pelvic Repair.—Multiparae, with marked contraction of the outlet, who give a history of difficult delivery at previous labors, even though the children may have lived, and who have suffered from serious lacerations which have been successfully repaired, present a definite indication for cesarean section. This is the case because a more or less forcible operation will be necessary to effect delivery, and, owing to the fact that the cicatricial tissue left after the operation for repair will probably not stretch sufficiently to permit delivery, a severe, if not complete, laceration is almost inevitable. This laceration being largely through scar tissue, the vitality of which is low, will in all probability heal only partially when sutured and require a secondary operation for relief. Furthermore, the increasing size of children in successive pregnancies tends to render each succeeding delivery more difficult, and, therefore, more dangerous to the child as well as to the maternal tissues. For these reasons it is clear that, from the standpoint of both mother and child, certain very definite advantages appertain to cesarean section as an elective procedure in such cases, even though a

pelvic delivery may be possible, and the avoidance of invalidism and of election.

Elderly Primiparae with Funnel Pelves.—In elderly primiparae who show contraction of the pelvic outlet of even a moderate degree cesarean section is distinctly the operation of election for two reasons: in the first place, all danger to the child should be avoided, unless it involves too great an increase in the risk to the mother, since it is very possible that there may never be another pregnancy in women of forty or over, and no serious risk of losing the child during pelvic delivery is justifiable when its life can be practically guaranteed by abdominal delivery. Furthermore, in this class of patient the soft parts are more apt to be rigid than in younger women and, therefore, are more liable to extensive laceration with its consequent disability. I believe that the majority of primiparae over forty years of age are best delivered by cesarean section at the time of election, both to avoid the possible loss of the child, and severe laceration, which is often inevitable if pelvic delivery is attempted, even though the pelvis may be normal; and if the patient shows even moderate contraction of the outlet abdominal delivery is, in my opinion, even more distinctly indicated.

Young Primiparae with Funnel Pelves.—In young primiparae with funnel pelves the question is an open one. The performance of cesarean section on young women is liable to mean repeated operations, until finally the patient is sterilized to avoid their necessity. Some authorities, therefore, recommend a primary pubiotomy in these cases, in the hope that not only will the present child be successfully delivered, but that as a result of the operation the pelvis will be sufficiently enlarged to permit of the occurrence of spontaneous labor in subsequent pregnancies. My own personal preference is for cesarean section in this type of patient, but the excellent results which some writers report after primary pubiotomy must be taken into consideration before definitely dismissing the question as settled. Other writers do not seem to have been fortunate in securing permanent enlargement of the pelvis after pubiotomy, though the operation otherwise proved successful, and in the absence of a definite agreement as to the results to be expected in pubiotomy, both as regards the future of the patient from a childbearing standpoint, as well as the immediate risk to life, the wiser course is cesarean section in doubtful cases. By this means the life of the child can be practically guaranteed, and the mother will be restored promptly to perfect health. The danger to the maternal life in cesarean section in good hands, in a proper hospital, and when performed on a patient in good general condition, should

not be any greater than, if as great as, that attending pubiotomy if one can judge by the general statistics, although such a series of cases as published by Williams would lead one to suppose that pubiotomy is not attended by risk to life. Other operators, however, have not had as good results, and there would seem to be a definite, though small, mortality attendant on pubiotomy, practically as great as that attending the primary cesarean section. Furthermore, pubiotomy undoubtedly has, in the hands of the average operator, a higher morbidity and is more likely to leave some permanent disability, than cesarean section at the time of election. It is probable, however, that pubiotomy has a distinct place in patients seen late in labor, since in these cases the results of cesarean section are relatively unsatisfactory, even though no definite symptoms of infection are present.

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CHAPTER III

OTHER PELVIC INDICATIONS

Kyphotic Pelvis—Spondylolisthetic Pelvis—Coxalgic Pelvis—Obliquely Contracted Pelvis—Transversely Contracted Pelvis—Osteomalacic Pelvis—Pelvic Exostoses—Tumors of Pelvis—Old Pelvic Fractures—Bibliography.

No discussion of the pelvis in relation to the necessity for cesarean section would be complete without including the more uncommon pelvic deformities, due to abnormalities outside the pelvis, or to abnormalities of development. The forms of pelvic contraction which have been under discussion in the previous sections have been due to some developmental fault in the pelvis as a whole, possibly complicated by rachitis in early life, or in other cases due to a simple lack of development, or to weight bearing at a period of life when the bones of the pelvis were still soft and malleable.

Other forms of deformed pelvis remain for consideration in which the pelvic changes, due to abnormalities in the development of certain of the pelvic bones, are responsible for the deformity; or else it is produced by disease in other portions of the skeleton, as for instance in the spinal column or hip joint, which brings about changes in the pelvis owing to a faulty transmission of the body weight. The majority of patients who show these deformities have some peculiarity of figure or of gait, which should attract the attention of the most careless observer, and thus serve as an indication for careful examination to estimate their importance, although only too often no attention is paid to them.

Kyphotic Pelvis.—The changes in the pelvis which result from spinal caries vary according to the level at which the spine is affected. If the deformity is in the dorsal region, it is compensated for by a marked lordosis below it, and the pelvis is little changed. When the kyphos is in the lumbar region, the attempt at compensation produces marked changes in the pelvis, which are increased in degree, the lower the process. The main characteristic of the pelvis in these cases is a marked funnel shape, the iliac crests being flared out and the ischial spines and tuberosities approaching each other. The effect on labor is even more pronounced than in the ordinary form of funnel pelvis, since the sacrum is

rotated to some extent on its transverse axis and the tip approaches the symphysis. The posterior sagittal diameter of the outlet is thus shortened, and a contraction of the bischial diameter to less than 8 centimeters in these cases is an absolute indication for a radical operative delivery, preferably cesarean section, if the child is living and the patient otherwise a good operative risk, since the anteroposterior contraction of the outlet renders the chance of spontaneous delivery in these cases practically nil, and the ordinary operative procedures usually result in death of the child and greatly increased risk to the mother. Pubiotomy may be con-

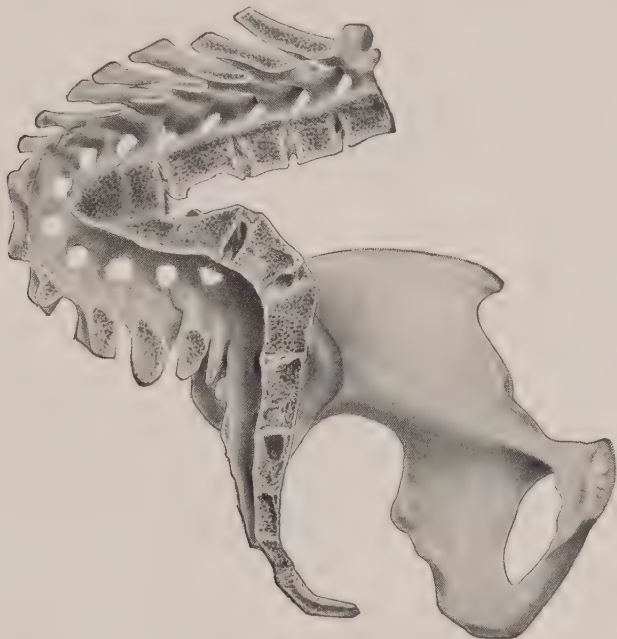


FIG. 16.—DORSOLUMBAR KYPHOSIS: LONGITUDINAL SECTION.

sidered, if the transverse diameter is not less than 6 centimeters and the patient is a doubtful cesarean risk, owing to the length of time she has been in labor or for some similar reason. If the child is dead, craniotomy is the operation of choice, and if the patient is believed to be infected, cesarean section followed by hysterectomy will give the best results.

When the lumbosacral junction is the site of the disease, the lumbar vertebrae may collapse forward and completely block the pelvic inlet, making the entrance of the presenting part into the pelvis practically impossible.

The results of labor in kyphotic pelvis have proved very unsatisfactory. The fetal mortality is given as between 40 and 50 per cent and the maternal prognosis varies with the degree of contraction, being in one

series of cases 24.3 per cent. Cesarean section at the time of election is the indicated treatment in all cases where the pelvic contraction is at all marked, and I believe it to be the elective procedure in all cases in which any reasonable doubt exists as to the possibility of a pelvic delivery.

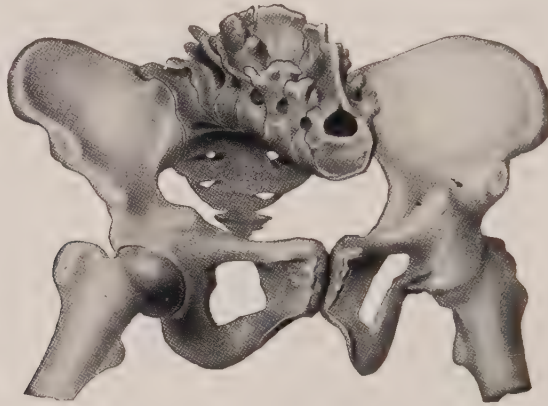


FIG. 17.—PELVIS OBTECTA.

Spondylolisthetic Pelvis.—This rare deformity has a very serious effect on labor, if it is at all marked. In slight cases it modifies the course



FIG. 18.—SPONDYLOLISTHESIS.

of labor much as does a flat pelvis, but in marked cases the entrance of the presenting part into the pelvis is seriously interfered with by the displaced lumbar vertebrae which overhang the pelvic brim. If the pseudoconjugate diameter in these cases is under eight centimeters,

cesarean section is the operation of election, since the delivery of an average sized child through a pelvis of this size is practically impossible. If the pseudoconjugate diameter is more than eight centimeters, spontaneous delivery is sometimes possible. This variety of deformed pelvis is, however, so rare that, if an arbitrary limit of nine centimeters is set for the limit of spontaneous labor, and all patients with a pseudoconjugate diameter less than that are submitted to cesarean section, very few mistakes will occur.



FIG. 19.—WOMAN WITH SPONDYLOLISTHESIS.

Coxalgie Pelvis.—Hip disease, occurring in early life, gives rise to an obliquely contracted pelvis. If the disease begins before the child has learned to walk, or if the child is confined to its bed for a considerable length of time, the diseased side of the pelvis shows definite atrophic changes and is distinctly smaller than the other half of the pelvis.

When the child begins to stand the body weight is transmitted in great part to the well leg, either because of the shortening of the diseased leg or from fear of pain as a result of throwing weight upon it. The pelvis thus becomes obliquely tilted, the well side being the higher. The increased force transmitted to the well leg tends to push that side of the pelvis upward, inward, and backward, and an oblique contraction re-

sults, which involves both the superior and inferior straits. Not uncommonly ankylosis of the sacro-iliac joints occurs. As a rule the oblique contraction is found on the well side of the pelvis, but when the diseased leg is ankylosed in a position of abduction and internal rotation the reverse is said to be the case.

Oblique contraction of the pelvis also occurs in cases of one-sided congenital dislocation of the femur, though usually to a less degree than in disease of the hip, and similar changes may occur in untreated unilateral infantile paralysis or in cases of shortening, due to disease of the knee or ankle, or after amputation.

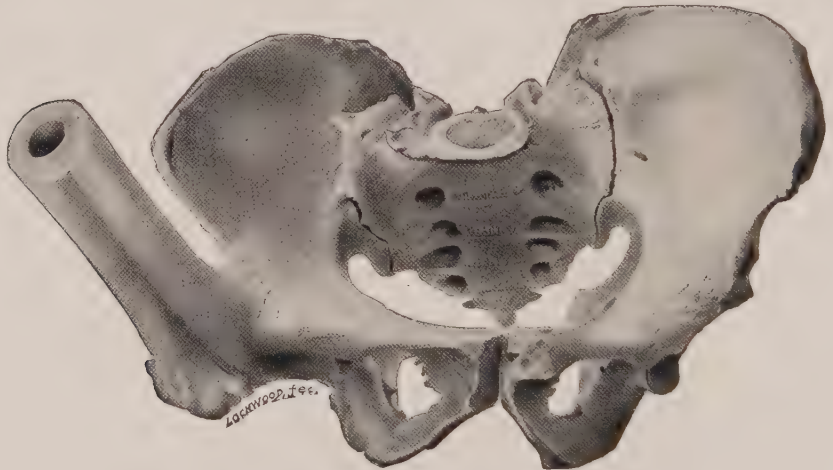


FIG. 20.—COXALGIC PELVIS WITH ANKYLOSED FEMUR.

The possibility of serious pelvic contraction can hardly be overlooked in these cases, since the patient shows a pronounced limp on walking. If questioning elicits the information that the condition has existed since early childhood, it is probable that pelvic examination will show atrophy of the diseased side of the pelvis in combination with oblique contraction of the well side. Careful examination will give accurate information as to the nature of the deformity, but its effect on labor can only be estimated by careful exploration of the cavity of the pelvis under anesthesia, which may be difficult, since the diseased leg may be ankylosed in such a position as to interfere seriously with the necessary manipulations. The ordinary pelvic measurements are of no value in estimating the degree of contraction, and those suggested by Nägele for use in oblique contraction will not give the full information required, although they will afford some help. Fortunately the degree of contraction is seldom extreme, but serious interference with labor may occur. The deformity involves the inferior as well as the superior strait, and the position of

the ankylosed leg may interfere seriously with operative procedures undertaken to deliver the patient.

If examination under anesthesia demonstrates the fact that engagement is improbable, an elective cesarean is indicated, as it is also in multiparae with a history of previous dystocia. If there seems to be no serious obstruction to engagement, if the child is not larger than the average, and if the outlet is not seriously contracted, it is probable that delivery through the pelvis will occur and the case should be left to nature, under careful observation. In these cases a modified test of labor, conducted under careful asepsis, will often determine the proper treatment of the case. If after four or five hours of good first stage labor, the

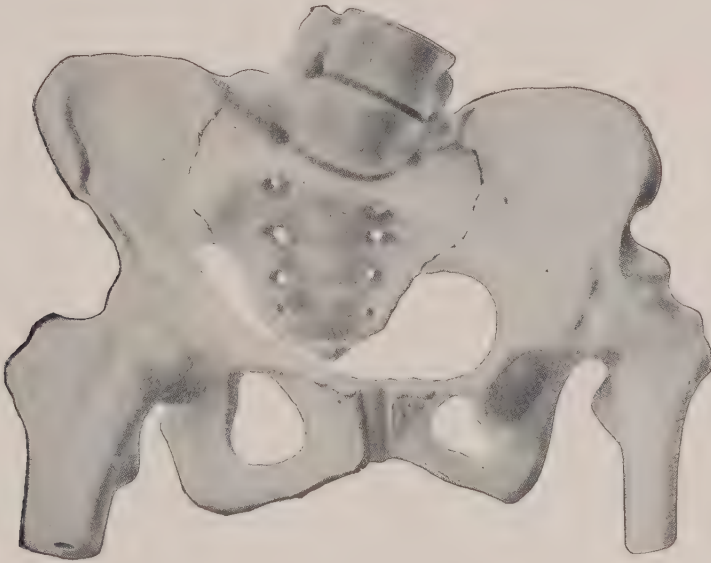


FIG. 21.—PELVIS OBLIQUELY CONTRACTED FROM TENSION OF DIS-LOCATED FEMUR.

head shows no sign of entering the pelvis, the conservative policy should be abandoned and the patient delivered by the abdominal route.

Obliquely Contracted, or Nagele Pelvis.—This form of contracted pelvis is of very rare occurrence, but causes serious dystocia in the majority of instances, when found. The main characteristics are an oblique contraction, involving both the brim and outlet, combined in most cases with ankylosis of the sacro-iliac joint on the affected side. The cause of the pelvic deformity is a lack of development, or even practical absence, of the sacral alae on one side, which results in an oblique contraction. The patients do not limp, and the ordinary pelvic measurements do not show the degree of contraction. The attendant's attention

should be called to the presence of some abnormality by the fact that one iliac crest is higher than the other, and that a more or less marked

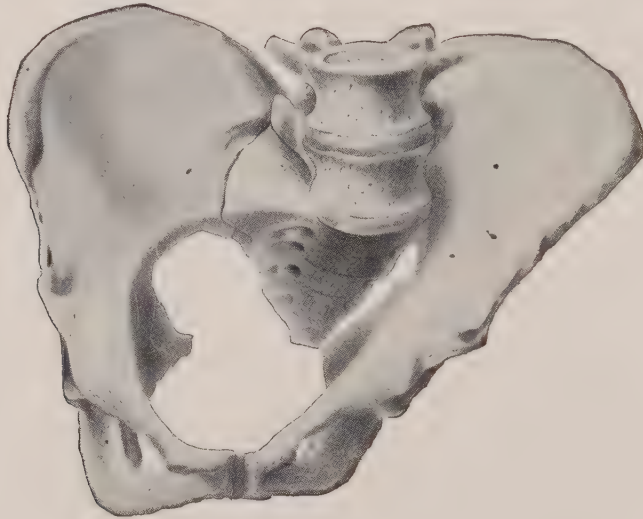


FIG. 22.—PELVIS OBLIQUELY CONTRACTED (FROM IN FRONT).

scoliosis is present, when further investigation will reveal the deformity. Since careful examination of the pregnant woman is the exception and

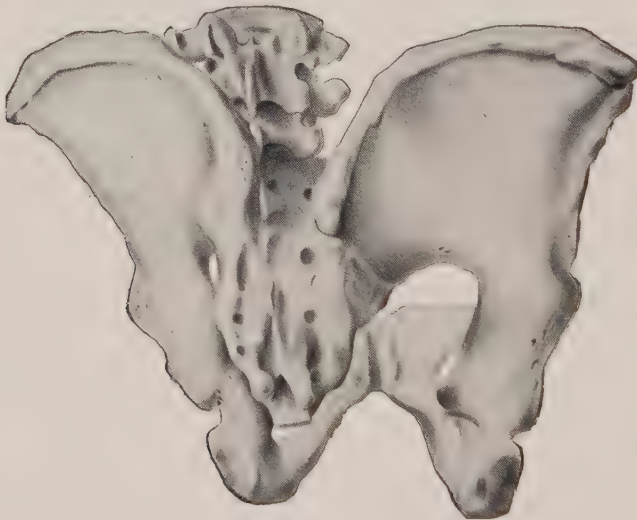


FIG. 23.—PELVIS OBLIQUELY CONTRACTED (FROM BEHIND).

not the rule, most cases pass unrecognized till the development of dystocia calls for careful investigation. The importance of early recognition is considerable, because in all but slight cases delivery through the pelvis

is impossible and pubiotomy is out of the question, owing to the ankylosis of the sacro-iliac joint. In marked degrees of contraction either cesarean section or craniotomy is necessary for delivery, and the former is indicated whenever the deformity is discovered during pregnancy or at a period of labor which does not contraindicate abdominal delivery.

Transversely Contracted, or Robert Pelvis.—This form of contracted pelvis is seen when the sacral alae on both sides are imperfectly developed. Examination shows that all the transverse measurements are markedly shortened, while the anteroposterior measurements are practically unchanged. It is an exceedingly rare form of contracted pelvis, but in all reported cases the transverse narrowing has been so great as to render the birth of a living child impossible. Cesarean sec-



FIG. 24.—PELVIS TRANSVERSELY CONTRACTED.

tion at the time of election, if the condition is discovered as it should be before the onset of labor, is the only rational treatment.

Osteomalacic Pelvis.—Osteomalacia is a very rare disease in this country, but occurs sufficiently often so that every obstetrician of large hospital experience is liable to meet with an occasional case. Since the vertebral column and pelvis are the portions of the skeleton most affected, it has a special importance obstetrically, particularly since the pelvic change increases in repeated pregnancies, so that instead of labor becoming easier it may eventually become impossible and require cesarean section for delivery.

The history of these patients is usually quite characteristic and aids greatly in the diagnosis of the condition. The parturient woman, usually a multipara, complains of muscular symptoms, generally involving the iliopsoas muscles, associated with rheumatoid pains. The same symptoms

recur with increased severity in each succeeding pregnancy and labor is more difficult than ever before. If pregnancy again occurs, the pains become more severe and locomotion is so interfered with that for the last months of pregnancy the patient is bedridden and craniotomy or cesarean section is necessary at the time of labor.

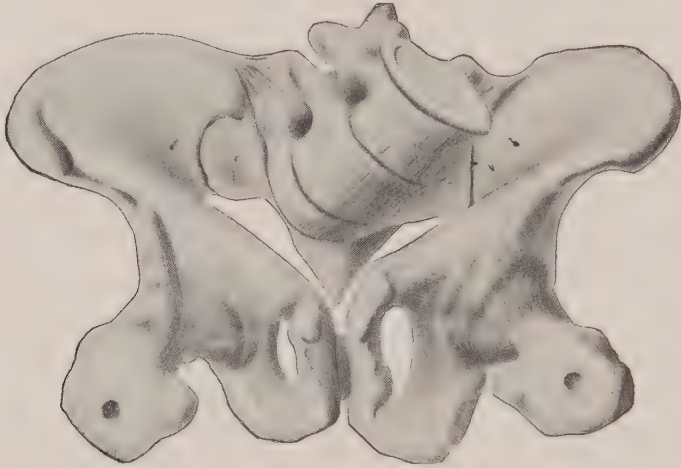


FIG. 25.—OSTEOMALACIC PELVIS (FROM ABOVE).

Shortly after delivery the pains disappear, and when the patient is able to be up and about again she notices she is some inches shorter than

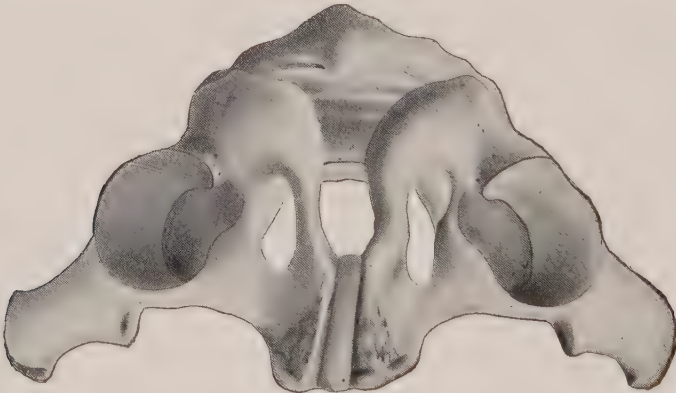


FIG. 26.—OSTEOMALACIC PELVIS (FROM BELOW).

previously, and at times kyphotic changes develop in the vertebral column.

The changes in the pelvis depend entirely on the degree of softening of the pelvic bones. In the early stages of the disease a simple flattening results. In the later stages, when the bones have become very soft, the pelvic cavity becomes so compressed by the pressure of the body weight

that labor is impossible. The pelvis may take on almost any shape, according to the direction in which pressure is transmitted to it. In all but early cases, in which the pelvic change is slight, cesarean section is the operation of choice, followed by removal of the ovaries, since this procedure is said to be successful in producing a cure of the disease, although its effect may be simply that of preventing further progress by rendering pregnancy impossible.

Atypical Pelvic Deformities.—In rare cases the pelvis may be more or less deformed by the presence of exostoses at various points, and less frequently by tumor formation.

EXOSTOSES.—Exostoses most frequently occur on the posterior surface of the symphysis, just in front of the sacro-iliac synchondroses, or upon the anterior surface of the sacrum. In very rare cases they may be found along the iliopectineal line. In exceptional cases they may be of sufficient size to cause a serious obstruction to labor, but their effect is more likely to be that of causing injury to the maternal soft parts, and several cases have been reported in which they have cut through the lower uterine segment and have caused serious hemorrhage, or even death. If they seem to be of sufficient size to cause dystocia, or sharp enough to endanger the maternal soft parts, cesarean section offers the safest means of delivery.

TUMORS OF THE PELVIS.—Tumor formations of various kinds may arise from the walls of the true or false pelvis and reach such proportions as to render labor impossible. Enchondromata are the most common variety, but fibromata, osteomata, carcinomata, and osteosarcomata have been described. The dystocia depends principally on the size of the tumor and the degree to which it obstructs the pelvic cavity. The growth is apt to be rapid during the pregnancy, and, therefore, the degree of obstruction can only be properly estimated shortly before the beginning of labor.

Before the introduction of cesarean section in the treatment of these cases, 50 per cent of the mothers and 89 per cent of the children are said to have perished. Cesarean section is, therefore, indicated in all cases in which the cavity of the pelvis is markedly obstructed by a new growth; and in less marked cases, in which a trial of labor may be allowed, the progress of the case should be most carefully watched, and if there seems to be any doubt as to the passage of the head through the pelvis after a few hours of labor, section should be promptly resorted to.

Old Pelvic Fractures.—In rare instances healed fractures of the pelvis may render delivery through the pelvis absolutely impossible. The

obstruction may be due either to excessive callus formation, or to projection of the broken ends of the bones into the pelvic cavity. This cause of dystocia is a very uncommon one, owing to the comparative rarity of fractures of the pelvis and to the frequency with which such patients succumb to the internal injuries which accompany the fracture of the pelvis, so that comparatively few survive and fewer still become pregnant.

The effect on labor depends on the location of the fracture, the degree of callus formation, and the displacement of the ends of the bones. The ordinary pelvic measurements give little or no clue to the internal conditions, and the pelvis should be thoroughly palpated under anesthesia, if necessary, to determine the degree of obstruction. In all cases in which any doubt as to the result of labor exists cesarean section is the operation of election.

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CHAPTER IV

NON-PELVIC INDICATIONS FOR CESAREAN SECTION

Cesarean Section in Pelvic Obstruction Not Due to the Pelvis Itself—Tumors of the Uterus—Fibromyomata—Carcinoma of the Cervix—Tumors of Other Organs—Ovarian Tumors—Prolapse of Kidney or Spleen—Echinococcus Cysts—Tumors of Bladder—Tumors of Rectum—Atresia of Birth Canal—Vulva—Vagina—Cervix—Uterine Displacements—Anteflexion—Retroflexion—Dystocia Following Operations for Uterine Displacements—Cesarean Section on Account of Previous Incision of Uterus—Bibliography.

When cesarean section was first recognized as an operation which could be legitimately performed as an elective procedure, instead of as an operation of last resort, its employment for some time was limited to cases in which no other means of securing a living child was believed possible, and pelvic obstruction was the one indication which was considered to justify its performance.

With the progress of time, increasing experience has proved it to be a relatively, though not absolutely, safe operation in properly selected cases when performed under proper conditions, until at the present time it is recognized that it may properly be substituted for a pelvic delivery in cases in which, though the delivery of a living child may be possible, the risk to the life or health of the mother and the risk to the child are sufficient to warrant the selection of abdominal delivery, as being on the whole the safest method of delivery when the interests of one or both patients are considered in the light of the conditions present in the given case. In other words our position at the present time is that, whenever cesarean section offers any marked advantage to either patient over vaginal delivery, cesarean section becomes the operation of choice. This change of opinion has been gradual, and one indication after another has been added to the list of indications for the operation, until at the present time scarcely any obstetric complication remains, for which cesarean section is not enthusiastically recommended in the literature, and successful cases are reported to support the contention of the operator. The unsuccessful cases, however, are apt not to be reported, and the literature does not fairly represent the results of the operation.

In some cases cesarean section is a life or health saving operation, and the gain to the patient is very great; in others it is merely the

lesser of two evils, the outlook not being good in any case for a satisfactory result; and in still another group of cases it is performed without adequate reason, being merely the easiest way out of a trying situation for the attendant, without due regard for the well being of the patient, either present or future. It is important, in undertaking any operative procedure to effect delivery, not to lose sight of the fact that it must be of real benefit to the patient; and that unless the patient is a Catholic no operation should be undertaken which seriously endangers her life for the sake of saving the child, when any other method of delivery is possible which may be safer for her. Furthermore, the fact that one cesarean section is likely, in the majority of cases at least, to be followed by cesarean section in future pregnancies, should lead to conservatism in regard to its performance for temporary indications which will probably not recur in subsequent pregnancies.

These facts should be borne in mind in choosing the method of delivery in all cases in which there is a reasonable choice, and the operation selected should be chosen after careful consideration of the pros and cons, and not simply as the operation best suited to the ease of the operator, which is today one of the leading indications for the performance of cesarean section, with the result that many maternal lives are sacrificed, which would be saved if the proper operation had been selected.

Tumors of the Uterus and Other Pelvic Organs.—Tumors connected with the uterus or other pelvic organs may so obstruct the pelvis as to render the entrance of the presenting part impossible, and thus may furnish an absolute indication for abdominal delivery.

FIBROMYOMATA OF THE UTERUS.—Fibromyomata of the uterus may seriously complicate pregnancy and labor. The effect which they produce varies markedly with their size, number, and location. Miscarriage may result from the associated endometritis. Interference with the circulation of the tumors may cause sloughing at any period of pregnancy, or their rapid growth may cause pressure symptoms which may call for operative relief before the baby reaches the period of viability. In the majority of cases, however, their effect on pregnancy is slight.

If a patient passes through pregnancy without serious trouble, the only effect which fibroids in the upper portion of the uterus will have on labor is to interfere with the uterine contractions to a greater or less extent. In a patient with multiple fibroids, with a rigid undilated cervix, in whom the trial of a few hours of labor demonstrates the fact that the uterine contractions are too weak to effect proper cervical dilatation, cesarean section may properly be considered as the safest means of

delivery. This is even more the case, since there is always a possibility of sloughing of the tumors during the puerperium, and, furthermore, an operation must usually be performed at some future time for the removal of the fibroids and the cure of the patient. The section should, in these cases, be followed by a supravaginal amputation of the uterus. If the fibroids exert no influence on the labor, the wisest course is to deliver the patient from below and reserve the curative operation for a later date, in the hope that it may be rendered unnecessary by the involution of the tumors after delivery, the increase in the size of the tumors during pregnancy being largely due to edema, and not to actual hypertrophy.

Fibroids of the lower uterine segment or cervix may so obstruct the pelvic canal as to render the entrance of the fetal head into the pelvis apparently hopeless. In such a case it is wise to reserve the actual decision as to the best method of treatment until the patient goes into labor, or the estimated date of labor is reached, since it is a matter of common experience that tumors which seem to block the pelvis hopelessly a few weeks before the onset of labor may be drawn out of the pelvis toward the end of pregnancy and cease to offer an obstacle to delivery. Many cases are reported in which the tumor has remained in the pelvis until after labor has begun, and then has been drawn up out of the pelvis under the action of the uterine contractions. This solution of the difficulty, however, fails to occur in the majority of such cases, and the danger of operation after prolonged labor is so greatly increased that the wisest course is to deliver all such patients by cesarean section, when the tumor so blocks the pelvis as to prevent the entrance of the presenting part at the beginning of labor, the operation being completed by hysterectomy or not, according to the size and accessibility of the tumors and the condition of the patient. Occasionally tumors atrophy and disappear during the puerperium and a radical operation may not be necessary, but if the uterus contains several good sized fibroids, this is hardly to be expected, and in any case the patient should be removed to a properly equipped hospital, where any surgical procedure which may prove necessary can be performed under proper conditions.

CARCINOMA OF THE CERVIX.—Cancer of the cervix, complicating pregnancy, may, in rare cases, be a legitimate reason for a cesarean section. This will depend, however, on the period of pregnancy at which the diagnosis of cancer is made and the apparent operability of the case. When the diagnosis is made early in pregnancy and the disease is apparently so limited in extent that it seems probable that the patient can be cured by operation, the only proper treatment is a complete hysterectomy by the Wertheim method without regard to the pregnancy, the

mother being the more important of the two, and her life being dependent on the prompt removal of the growth. The fact that cancer increases rapidly during pregnancy renders the operation almost an emergency one, since the delay of even a short time may render the case inoperable. If the case seems to be inoperable when first seen, the child becomes the more important patient, and every effort should be made to prolong the pregnancy to the period of viability, in its interests. If the mother begins to fail rapidly after the child is viable, but before full term is reached, the child should be delivered by cesarean section, since this method is the safest for it, and under the circumstances can do the mother no harm.

If the disease is discovered during the latter part of pregnancy and is supposed to be operable, the child should be delivered by section and the uterus removed, in the attempt to save both patients. If, however, the case is considered inoperable, the pregnancy should be allowed to go to term and the method of delivery chosen according to the local conditions. In some cases the involvement of the cervix and vaginal wall will be so extensive that any attempt at delivery through the vagina is likely to be accompanied by such extensive laceration and hemorrhage as to shorten the life of the mother, even if it is possible to secure sufficient dilatation of the cervix to render delivery possible. In cases of this nature cesarean section is the operation of choice in the interests of both patients, since it will not only increase the safety of the child, but will prolong the mother's life.

OVARIAN TUMORS.—Ovarian tumors not infrequently complicate pregnancy and add greatly to the dangers of the condition. In many cases the pedicle becomes twisted during pregnancy and a prompt operation is the only means of saving the patient's life, and in other cases rupture of the tumor occurs during labor, which is sure to be disastrous, if the tumor is either a dermoid or of a malignant type. Owing to this fact, it is generally agreed that the discovery of an ovarian tumor in the first half of pregnancy should call for prompt operation and its removal, and experience shows that the operation will not interfere with the progress of pregnancy in the majority of cases.

When the tumor is discovered in the latter part of pregnancy, the treatment depends on the symptoms it causes and on its location. If the tumor is free in the abdominal cavity it should be removed promptly, at any time previous to the last month of pregnancy, and even then if it is causing any symptoms, since it is a constant menace to the patient. It is not an indication for cesarean section, unless it is so situated as to interfere with labor, though symptoms of twisted pedicle may arise

either during labor or during the puerperium, which will necessitate immediate laparotomy. In some cases, however, the tumor becomes prolapsed into the pelvis in front of the presenting part in such a manner as to effectually prevent the entrance of the presenting part and thus render a pelvic delivery impossible, unless a reposition of the tumor can be effected. In some cases postural treatment by means of the kneechest position will prove successful, and the tumor will become replaced above the pelvic brim. This often fails, however, and the removal of the tumor is necessary to free the pelvis. Some authorities recommend that

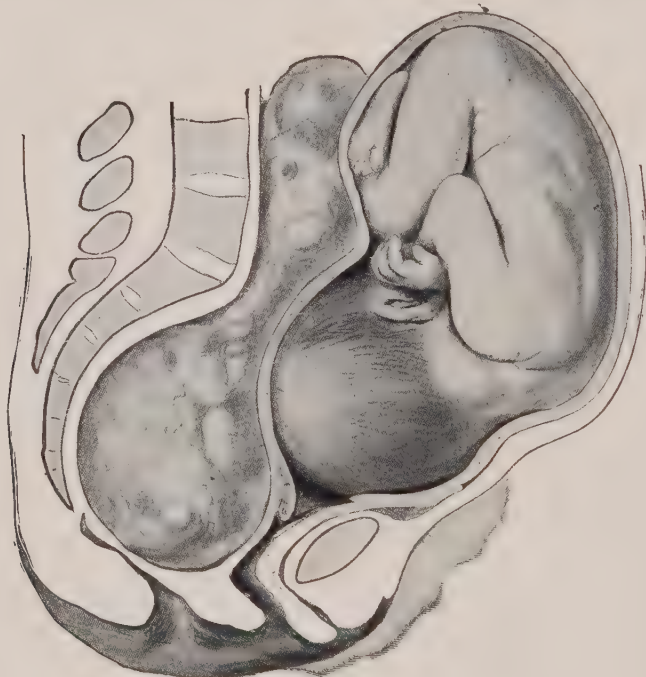


FIG. 27.—DYSTOCIA FROM OVARIAN CYST.

the patient be allowed to go into labor, laparotomy being performed and the tumor removed when the cervix is nearly fully dilated, and delivery then being effected by forceps or version. In some cases, however, the tumor will rupture with disastrous results, if submitted to the pressure of labor, and the wisest course would seem to be to deliver the patient by cesarean section at the time of election and remove the tumor at the same time. A considerable proportion of these tumors are either dermoid cysts or of a malignant nature, and to subject the patient to the danger of rupture of such tumors is distinctly unwise. For the same reason puncture through the vagina is absolutely contraindicated.

Since laparotomy is indicated for the removal of the tumor, the most

satisfactory treatment for all ovarian tumors which are so situated as to interfere with delivery is cesarean section and ovariectomy, and the results will be better under this method of treatment than if the patient is allowed to undergo the exhaustion of a long labor and then is subjected to a laparotomy. The only disadvantage of this method of treatment lies in the fact that the scar left in the uterus acts as a point of weakness and possible rupture in future pregnancies and labors, and at the present time there is a strong feeling among most surgeons that, if a patient is once delivered by section, future deliveries are most safely accomplished in the same way. I personally believe that, if a patient has once been delivered by cesarean section, it is distinctly unwise to allow her to go into active labor in future pregnancies, although if the uterine wound has been properly sutured and if the convalescence has been absolutely afebrile, the risk involved is probably not a great one; but I believe it to be greater than that of repeated cesarean section at the time of election.

TUMORS NOT CONNECTED WITH THE GENERATIVE ORGANS.—Interference with labor by tumors not connected with the pelvis or generative tract is of rare occurrence, but must be borne in mind as a possible indication for cesarean section.

Kidney or Spleen.—Prolapse of normal or enlarged kidney into the pelvis may so obstruct the pelvic cavity that, if it is not discovered and removed during pregnancy, cesarean section will prove necessary for delivery, a small number of such cases being reported in the literature. One case has been reported in which a prolapsed spleen was removed from the pelvis in the second month of pregnancy, thus suggesting that in rare instances a prolapsed spleen, which is not discovered during pregnancy, may prove a serious obstruction to labor and necessitate cesarean section.

Echinococcus Cysts.—Large echinococcus cysts may occupy the pelvic cavity and necessitate cesarean section in very rare instances.

Tumors of the Bladder.—Tumors of the bladder may sometimes interfere with the normal mechanism of labor, but are rarely large enough to call for radical interference; but large calculi, unless removed, may cause sufficient obstruction to render abdominal delivery necessary.

Tumors of the Rectum.—Large tumors arising from the rectum or pelvic connective tissue may so obstruct the pelvis as to render cesarean section necessary. Cancer of the rectum has had this effect in a considerable number of cases, and other tumors less frequently.

Atresia of the Generative Canal.—**VULVA.**—Incomplete atresia of the vulva may present, in rare cases, such an obstacle to delivery that it is either impossible or sure to be attended with such extensive laceration

that cesarean section is the wisest course, in order to prevent serious damage with its consequent invalidism. This condition is usually due to cicatricial changes, consequent either upon trauma or upon severe inflammatory conditions, and in most cases the scar tissue will soften during pregnancy sufficiently to permit delivery without too extensive injury. If, however, the scar tissue does not soften during pregnancy, cesarean section should be performed as the only means of preventing serious damage and the possible invalidism which may follow. The same holds true in women who have suffered serious injury to the soft parts in previous deliveries and who have been subjected to extensive repair operations, since delivery per vaginam will very probably result in serious damage, the repair of which may prove unsatisfactory.

VAGINA.—Incomplete vaginal atresia may give rise to serious dystocia at the time of labor. The cases which cause serious trouble are almost always secondary in origin and result from the extensive formation of scar tissue following injuries or inflammatory processes. In the great majority of cases the cicatricial tissue undergoes marked softening during pregnancy, and the pressure of the presenting part after labor begins overcomes the obstruction sufficiently to permit of manual dilatation or incision, without too great risk of serious damage. In cases in which no softening occurs during pregnancy and the obstruction remains so resistant that dilatation seems improbable or likely to result in serious damage to the surrounding structures, cesarean section is indicated at the onset of labor.

Tumors of the Vagina.—Solid tumors of the vagina or surrounding tissues may offer an insuperable bar to labor. When the tumor is accessible excision is indicated, but if the tumor is first discovered shortly before the estimated date of labor or during labor, cesarean section may be necessary with removal of the tumor later.

CERVIX.—Cicatricial stenosis of the cervix frequently follows laceration occurring during difficult labor associated with infection and considerable destruction of tissue. Less frequently it may be due to syphilitic ulceration and induration. In rare cases it may result from the use of strongly corrosive substances employed for the purpose of producing abortion, and not infrequently it may result from gynecological operations for the repair of extensive lacerations, and is especially liable to follow amputation of the cervix, which is, therefore, an operation of doubtful expediency in women of the childbearing age.

Ordinarily the circulatory changes incident to pregnancy result in sufficient softening to render dilatation at the time of labor possible, or the stenosis will yield to dilating bags or to manual dilatation. In rare

cases, however, the rigidity is too great to be overcome by these means, and in such cases cesarean section is indicated early in labor, as soon as the condition is appreciated, since, unless prompt delivery is accomplished, stretching of the lower uterine segment will occur which will eventually result in rupture of the uterus, when relief is not given by abdominal delivery. In rare cases complete atresia of the external os may occur, due of course, to some process which has arisen after conception has taken place. Cesarean section offers the only means of relief in such cases.

Occasionally in elderly primiparae, and rarely in younger women, true rigidity of the cervix occurs and nature's methods of dilatation prove absolutely ineffective. The condition is also seen in an even more marked degree in patients who have suffered from inflammatory conditions involving the cervix. The choice of operation in these cases lies between abdominal and vaginal cesarean section and depends on the other conditions present, the size of the child and pelvis, the dilatability of the vagina and perineum, and whether the cervix can be drawn down to the vulva or is held high in the vagina by an inflammatory exudate. If labor comes on more than a month before the estimated date and the child is so small that vaginal delivery will prove an easy matter after the cervical obstruction is removed, vaginal hysterotomy is the operation of choice for such patients. If, however, the patient is at or near term and in good condition for cesarean section, this operation will ordinarily prove the most satisfactory method of delivery.

Uterine Displacements:—**ANTEFLEXION.**—In primiparae marked ante flexion of the uterus with the development of a pendulous abdomen usually affords evidence of the existence of a marked disproportion between the head and pelvis. Such a condition calls for careful examination before the onset of labor, and if serious disproportion is discovered cesarean section is indicated at the time of election. In multiparae this condition is usually due to the relaxed condition of the abdominal walls; and since any dystocia which may develop is due to faulty transmission of the force of the uterine contractions to the cervix, good results will sometimes follow the application of a tight abdominal bandage to hold the uterus in a relatively normal position, and cesarean section is only to be considered in cases in which the present child is out of proportion to the pelvis, it being larger than the former children, or when a moderate test of labor shows unsatisfactory progress.

RETROFLEXION.—In the great majority of cases in which the uterus is in retroflexion when conception occurs one of three results takes place. Either the impregnated uterus becomes restored to its normal position

spontaneously or by artificial means, the patient aborts, or incarceration of the retroflexed uterus occurs with urgent symptoms which call for relief.

In very rare cases, however, the pregnancy may go on to term, the fundus of the uterus remaining attached to the floor of the pelvis, while the anterior wall hypertrophies sufficiently to allow room for the development of the fetus. In this condition the head of the child occupies the fundus of the uterus, while the cervix is sharply bent and drawn upward, so that the external os lies above the level of the symphysis. When labor begins the uterine contractions tend to force the child through the most dependent portion of the uterus, i.e., the fundus, and the cervix dilates only partially. Spontaneous labor is out of the question. In some cases the cervix is fairly easily accessible and delivery can be accomplished by manual dilatation followed by version. In other cases, however, cesarean section offers the only hope of delivery, and if the case is left to nature, death of the mother from infection or rupture of the uterus is inevitable, since it is impossible to reach the cervix per vaginam to effect dilatation and delivery. An early diagnosis is essential to success under these conditions.

Dystocia Following Operation for the Relief of Retropositions of the Uterus.—The recognition of retrodisplacements of the uterus as a cause of ill health has led to the development of many operations for their relief. Several of these, although they rectify the malposition, may give rise to serious dystocia if the patient attempts to have children in the future. For several years it has been recognized that ventro- and vaginal fixations of the uterus are particularly liable to result unfavorably in future labors, and it has more recently developed that even a simple suspension may occasionally result in a fixation, even in the best hands, and cause dystocia. Operations of the Gilliam and Baldy types seem to be much less liable to cause trouble than the other operations, but I have seen one instance in which such distortion of the uterus resulted following a Gilliam operation as to render cesarean section the safest means of delivery, if not absolutely the only means.

The fixation of the fundus of the uterus to the abdominal wall produces various results during pregnancy, but in a general way the mechanism of the dystocia is as follows: the fundus being fixed by firm adhesions which prevent its mobility, the anterior wall of the uterus can only take part in the enlargement necessary for the accommodation of the growing ovum, if the cervix is drawn up out of the pelvic cavity, and even then its development is only partial. As pregnancy goes on the hypertrophied anterior wall is represented by a thick mass of muscle.

while the posterior wall is stretched in many cases almost to the point of rupture, and since this is the portion of the uterus which must act to expel the fetus, it is evident that the contractions will often prove feeble and inefficient and that delivery must be accomplished by operative means.

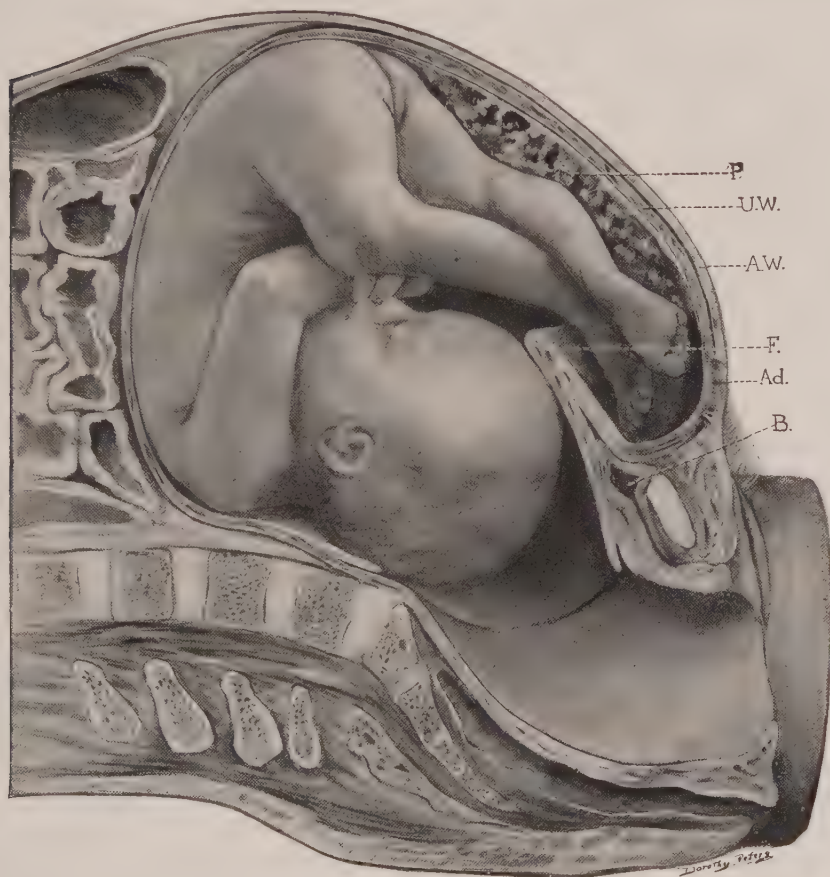


FIG. 28.—DYSTOCIA RESULTING FROM VENTROSUSPENSION.

A.W., abdominal wall; U.W., uterine wall; Ad., adhesion between uterus and anterior abdominal wall; B., bladder; F., anterior uterine wall, folded; P., placenta.

The possibility of delivery per vaginam depends largely on the position of the cervix. In some cases the anterior wall takes little part in the development of the uterine cavity and remains simply a thickened mass of muscle, while the cervix occupies its normal position, or nearly so. Such cases can be delivered by manual dilatation, followed by either forceps or version, due care being taken not to rupture the distended posterior wall of the uterus. In other cases, perhaps the majority, the

stretching of the posterior wall exerts marked traction on the cervix, with the result that some stretching of the anterior wall occurs, and the cervix is displaced upward and backward, being sometimes even above the level of the promontory of the sacrum and out of reach, while the pelvic brim is obstructed by the thickened anterior wall. Labor in such cases is ineffective and carries with it some danger of rupture of the posterior wall, while operative delivery from below is practically out of the question, owing to the inaccessibility of the cervix, which interferes with attempts at dilatation and with extraction of the fetus, if dilatation is secured.

Cesarean section is the operation of election in all cases in which there is marked upward displacement of the cervix, and may properly be combined with an attempt to separate the adhesions which fix the uterus to the abdominal wall. The greatest care must be taken in these cases to secure adequate contraction of the thinned out posterior wall after the extraction of the child, to prevent postpartum hemorrhage, and the uterus should be watched until proper contraction and retraction occur before the abdomen is closed. Unless proper contraction of the posterior wall can be produced, supravaginal amputation of the uterus should be performed, since, if the improperly functioning uterus is replaced and the abdomen closed, serious postpartum hemorrhage may follow with possibly fatal results.

Previous Cesarean Section or Other Operations on the Uterus.

—"Once a cesarean section, always a cesarean section" is a dictum which has been laid down by some authors and denied by others. That it is impossible for any patient who has had a cesarean section to be delivered by vagina in a subsequent pregnancy, is a statement which is manifestly absurd, since many patients have been delivered either spontaneously or by easy forceps operations, and rarely by version, with perfectly satisfactory results, when allowed to go into labor in subsequent pregnancies. On the other hand a certain small percentage (3-4 per cent) have suffered rupture of the uterine scar, either during pregnancy or labor, in later pregnancies. When this accident has occurred the majority of the patients have died from hemorrhage or peritonitis, but a sufficient number have shown such slight symptoms from the rupture that it is not possible to predict that even rupture of the uterus, when it occurs, is necessarily the dangerous accident in these cases that it is when it occurs during labor as a result of overstretching of the lower uterine segment or of improper operative procedures. Even though the mother has survived in these cases, the child is almost inevitably lost and laparotomy is usually necessary to effect delivery, so that it is a fair statement

that in all of the cases in which rupture occurs a disastrous result has followed.

After studying the scar in a series of cases in which the uterus had been removed for various reasons at the time of a second cesarean section, Williams came to the conclusion that a well healed cesarean scar is not a menace to the patient in later labors, and that in some cases no evidence of scar tissue can be found, even on microscopical examination. He, therefore, believes that if the wound is properly sutured primarily, and if the convalescence is afebrile, showing a complete absence of infection in the uterine wall, it is safe to allow the patient to go into labor, always supposing that the cause which rendered the first cesarean section necessary is no longer present.

On the other hand it is a common experience, in performing repeated cesarean sections, to find either a very thin scar at the site of the previous uterine incision, which would be a source of danger if labor were permitted, or to find that in a portion of the old wound the uterine musculature has separated and the fetal membranes or placenta are covered only by peritoneum, even in patients in whom no history of infection of the wound at the previous operation can be obtained and when the previous operation was performed by a competent surgeon so that there can be no suspicion that careless methods of suture were employed.

In the light of such conflicting evidence, it is evidently impossible to lay down any definite rule which can be applied to all cases, but each case must be considered on its merits. If the operation is performed for a permanent indication, e.g., for disproportion between the child and the pelvis, the dictum holds true, unless the baby is so much smaller in the second pregnancy that the disproportion no longer exists. If the primary operation was performed for temporary reasons, e.g., placenta previa or toxemia, and there are no complications to point to a weak scar, it is perhaps permissible to allow the patient to attempt labor, if she is in a hospital, so that prompt operation can be performed at the earliest indication of trouble; but even in such cases the danger to the patient is, in my opinion, such that I prefer to deliver every patient by cesarean section, if she has been previously so delivered, except when the patient is in active labor and delivery is imminent when she is first seen by the surgeon.

In the cases in which the patient has been in labor for some time when first seen and examination shows that rapid progress has been made in dilatation of the cervix and that the presenting part is well in the pelvis, so that it is evident that labor will soon be terminated if left to nature, there can be no excuse for cesarean section, and labor should be ter-

minated by forceps as soon as the cervix is fully dilated, so as not to subject the uterine scar to the dangers of the increased strain of the second stage of labor.

I strongly believe, however, that cesarean section at the time of election offers the safest method of delivery for patients who have been previously delivered by that operation. My own experience has been that in spite of the evidence in favor of a competent scar in uninfected cases, a certain number of scars are thin and weak, and I feel that we have no means of predicting the competency of the scar in the individual patient. This belief is based on personal observations in repeated cesarean operations on patients who have had afebrile convalescences after operations performed by presumably competent surgeons, and on reports of other cases in which rupture of the old scar has occurred either during pregnancy or labor under similar circumstances. It is undoubtedly true that the great majority of cesarean scars in such cases will stand a labor of average severity perfectly well, but it is impossible to predict which patient will suffer from uterine rupture, if allowed to go into labor. A sufficient number of scars do rupture to constitute a very real danger, even though the actual percentage is small. I feel that the danger of rupture is greater than the risk of the repeated operation and, therefore, believe that it is improper to subject a patient to a greater risk when a course which involves a less risk can be pursued. I am, therefore, accustomed to advise every patient who has once been delivered by cesarean section to have any subsequent pregnancies terminated in the same way.

There can be no question about the advisability of such a course in patients in whom the indication for the primary operation is a permanent one, since the reasons which rendered the first operation advisable remain unchanged, and in fact are strengthened by the fact that the scar left in the uterus by the first operation affords an added source of danger, if the patient is allowed to attempt labor.

In patients in whom the primary operation was done for some temporary indication, which is no longer present at the time of the second labor, I consider the presence of the uterine scar a sufficient indication for a repetition of the operation, although it may not always prove necessary in cases who have had an afebrile convalescence following the first operation. It should, however, be considered obligatory in patients who give a history of a febrile convalescence, since this points to the probability of uterine infection and unsatisfactory healing of the uterine incision, and it is in these patients that the rupture of the scar in subsequent pregnancies and labors is most to be feared.

In patients who are seen in subsequent labors well advanced in labor

with the head well in the pelvis and the cervix fully or nearly fully dilated, a repeated cesarean section is certainly unnecessary and unwise, but the labor should be terminated as promptly as possible after full dilatation is accomplished, to prevent all possible strain on the scar and thus minimize any possible danger of rupture. It is not in my opinion a question as to whether a pelvic delivery may not be possible without rupture of the uterus, but I believe that the fact that a certain number of presumably competent scars do rupture is a sufficient reason for never intentionally allowing such a patient to run the risk of labor when conditions are such as to warrant a repeated cesarean section.

A similar condition exists when the uterus has been operated on for the removal of myomata located deeply in its substance. If the tumors were subserous or were so situated that a fairly thick layer of normal muscle remained between the bed of the tumor and the uterine cavity, there need be little or no apprehension as to the behavior of the uterine scar at labor. If, however, the tumors were submucous, so that the uterine cavity was opened or the endometrium exposed during their removal, there is sure to be considerable formation of scar tissue, just as in septic cesarean scars, and the danger of rupture late in pregnancy or during labor is markedly increased. These cases should be watched most carefully during pregnancy and are best delivered by cesarean section at the time of election, rather than exposed to the danger of rupture of the uterus during labor. The same holds true for patients who have suffered a rupture of the uterus in a previous pregnancy or labor and have recovered to again become pregnant, although there are cases on record in which spontaneous delivery without complications has followed a rupture of the uterus in a previous labor.

In brief, the question may be summed up by the statement that whenever any condition exists in the uterus, which, in the opinion of the attendant, renders cesarean section a safer method of delivery for the given patient than a pelvic delivery, cesarean section should be performed. Opinions may differ and equally good men may take opposite positions for what seem to them good and sufficient reasons, but each operator must be guided by his own experience and do what he conscientiously believes is best for the given patient, and he will find authority for which ever course he may pursue. My own personal feeling is that, although in only a small percentage of cases will the uterine scar be found so inefficient as to expose the patient to a serious danger of rupture, except when the previous convalescence has been definitely febrile, none the less the safest course for the patient is repeated section. When the original cesarean indication is still present, there is absolutely no question as to the proper

procedure, and a repeated cesarean section is the only proper treatment.

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CHAPTER V

OTHER INDICATIONS

Cesarean Section in Toxemia of Pregnancy—Placenta Previa—Separation of the Placenta—Cardiac Disease—Poor Physical Equipment—Poor Nervous Equipment—Elderly Primiparae—After Operations for Repair of Previous Injury—Malpositions of Fetus, Breech, Face, Transverse—Postmortem Cesarean Delivery—Abdominal Abortion—Bibliography.

There remains for consideration a group of indications for the treatment of which cesarean section is often recommended and performed, but in which the choice of operation may be open to criticism from so-called conservative members of the profession. These conditions are sometimes temporary in character and sometimes permanent. The question to be decided in the individual case is not whether cesarean section is necessary to effect the delivery of a living child, but rather, whether it does not carry with it certain advantages to one or both patients which more than compensate for the increase in risk which is attendant on any abdominal operation. The gain to the patient may be increased safety to life or health at the present time, or it may be simply that, by eliminating the strain of labor, certain complications which are sure to arise in the future may be postponed at a minimum increase in the immediate risk. There is no question but that cesarean section offers the safest method of delivery for the child, and in cases in which the child is of paramount importance it may be indicated for this reason only, as long as it does not seriously increase the danger to the mother.

In considering these indications it is well to state that disproportion between the child and pelvis will not be considered as a factor, although if such disproportion exists, it naturally increases the urgency of the other indications, and they in turn may settle the choice of the operation in border line cases; but the question at issue is merely to consider the advisability of cesarean section in certain conditions when it is admitted that other methods of delivery, though possible, have very definite disadvantages. In other words the operation may be performed as the wisest method of meeting a situation which can be dealt with in other ways.

Toxemia of Pregnancy and Eclampsia.—It is out of place in a

discussion of cesarean section to consider the merits of the various methods of treatment for such a complication as the toxemia of pregnancy, but it is impossible to discuss methods of delivery and their relative advantages in a serious condition without briefly summarizing our present knowledge of the condition which calls for relief.

Toxemia is a condition arising during pregnancy only and, therefore, dependent to some extent at least on the pregnancy. The exact cause of the condition is unknown, and there may be multiple causes, any one of which associated with pregnancy may give rise to the disease, if it may be so called. Careful prenatal care will undoubtedly prevent a large proportion of the cases and will give an opportunity for its early discovery and treatment, if it does develop, with rather more than an even chance that all threatening symptoms will subside promptly, and that, in a certain proportion of the remainder, they will be relieved or held in abeyance, though not entirely cured. In a certain proportion, however, treatment has no effect, the toxemia increases, and the patient is in imminent danger of eclampsia, unless she is delivered or unless the baby dies as a result of the maternal toxemia, after which the symptoms as a rule subside, although in a small proportion of cases the death of the child results in, or at least is followed by, an increase in the toxemia.

Most of the cases of true eclampsia develop in the group of patients who do not yield to eliminative treatment, or who do not receive adequate prenatal care, and the best interests of the patient demand the termination of the pregnancy whenever the treatment of the toxemia fails to give relief, and before eclampsia develops. This is to be done by the method which seems to be the most conservative one for the given patient, after all the circumstances in the individual case have been considered. Severe toxemia, unless accompanied by chronic nephritis, is most often seen in primiparae in whom induction of labor and operative delivery is most apt to be difficult and attended by unsatisfactory results for both mother and child. In cases without pelvic disproportion the method of delivery is usually to be selected according to the condition of the maternal soft parts and the urgency of the symptoms. If the vagina is not rigid, and if the cervical canal is obliterated, so that labor may be easily induced by the use of a dilating bag, or in favorable cases by manual dilatation and delivery, which will be found to be the case in the majority of instances, the pelvic route is indicated. If, however, the cervix is rigid and the canal not obliterated, so that pelvic induction seems to promise marked difficulty, and if the toxemia is rapidly increasing, either vaginal or abdominal cesarean section is indicated, since in this type of case induction of labor often proves a slow and unsatisfactory procedure and time is an object. If the patient is markedly

premature with a small, possibly non-viable child, vaginal cesarean section is the preferable procedure, but if the child is large and the condition of the soft parts is such that serious laceration seems inevitable, if the pelvic route is selected, abdominal cesarean section offers very definite advantages for both patients. This is particularly true in elderly primiparae who may never have other children and to whom the possible loss of the baby during delivery is a relatively more serious matter than it would be to younger women, although it is never fair to any patient to take serious risks for the child, no matter what her age, when these risks can be avoided without seriously increasing the danger to her.

The development of eclampsia in patients who are under efficient observation, except in patients who present no premonitory symptoms (a very small class), should be extremely rare, since it is an evidence of lack of proper care or of lack of appreciation of the needs of the patient in the presence of threatening symptoms. There is a growing feeling among authorities who have followed the results obtained in prenatal clinics, that with proper care eclampsia may be made an almost obsolete condition; but this can only be accomplished by education of both the lay and medical public to an understanding of the mutual advantages to be derived from careful prenatal observation of every patient and the importance of prompt action in the face of threatening symptoms.

When eclampsia develops, a new problem complicates the situation. The patient is admittedly in an exceedingly dangerous condition, due at least in part to the pregnancy, and best relieved by the termination of the pregnancy, if that can be accomplished without adding to the danger. The patient is usually, however, profoundly shocked by the convulsions, and experience has proved that any operative procedure adds to the danger and that of all procedures cesarean section is the most dangerous under these conditions.

There are two distinct schools at the present time in regard to the proper treatment of eclampsia, the radical and the conservative. The radical school demands immediate delivery of the eclamptic patient as soon as convulsions occur, on the basis that, since eclampsia is in some way dependent on pregnancy, the only logical method of treatment must include termination of pregnancy by some means. *Accouchement forcé*, the dilating bag, vaginal cesarean and abdominal cesarean, all have their adherents, and each in the hands of certain operators has given fairly satisfactory results when compared with the results obtained in other clinics where operative delivery is practiced as a routine, but the mortality following operative treatment of the patients who are having convulsions is so high, no matter what method is used, as to suggest the wisdom of a change in policy.

If the obstetrician is committed to a policy of immediate delivery in all cases of eclampsia, cesarean section has a place, though it should not, in my opinion, be employed to the exclusion of other methods. If the patient is a primipara, especially if over thirty-five years of age, with a small, rigid vagina and a long, hard cervix, which will probably resist attempts at dilatation, by any means, vaginal cesarean section is indicated if the child is markedly small and premature, and abdominal cesarean section if the child is near term and well developed. The results of operation will be better in this class of case, if the patient is delivered by cesarean section, than if she is subjected to a difficult or violent accouchement forcé, but the maternal mortality following this operation is so high that it is not to be recommended, and medical treatment by the Stroganoff method gives far better results.

In the last few years the statistics of cesarean section for eclampsia have improved markedly, the mortality having progressively dropped from 75 per cent, as reported by Halbertsma in the early series of cases. However, at the present time the death rate is higher than that obtained by other operative measures, between 25 per cent and 35 per cent and the operation is not to be recommended on any basis.

In eclampsia, occurring in patients in whom the cervical canal is obliterated and the external os relatively soft and easily dilatable, cesarean section has no place, since the induction of labor on appropriate cases, and even accouchement forcé, will give equally good results and will leave the patient in a condition to have normal labors in future pregnancies, but even in these cases medical treatment will give better results than any operative procedure.

The members of the conservative school claim, and statistics seem to support them, that while it is undoubtedly logical to end the pregnancy, if it can be done without killing the patient, the shock of an operative delivery in any patient already shocked by repeated convulsions may turn the scale against her and result in death, when a more conservative policy might succeed in saving her life. They claim that in most cases labor will be initiated by the convulsions and that by waiting for labor and treating the toxemia in the meantime, instead of operating on every patient at the earliest possible moment, many lives will be saved; and this view is supported by the published statistics, although the mortality still remains fairly high, varying from 6.6 per cent to 15 per cent in different series of cases. This mortality is probably largely dependent on the toxemia which is the underlying cause of eclampsia and will never be materially lowered until eclampsia is practically eliminated by prenatal care, and by the delivery of all cases of toxemia in which prophylactic treatment fails before the

toxemia produces enough organic damage to cause the death of the patient.

The true place of cesarean section in eclampsia is in those patients who do not start in labor in spite of the convulsions, and who are getting steadily worse in spite of treatment, and in whom the condition of the soft parts renders operation from below more dangerous than abdominal section on account of the greater shock involved in accouchement forcé or the prolonged irritation of the cervix, plus the increased absorption of the toxins in cases where a dilating bag is employed. The results of cesarean section in these cases will show a very high mortality. In patients with eclampsia, who are already in labor, and who present a definite pelvic indication for cesarean section, the operation may be classed as a necessary one, and must be undertaken in spite of its dangers. These cases are, however, few in number.

The prevention of eclampsia by careful prenatal work and the delivery of the patient before convulsions occur by the most conservative method, which will sometimes be cesarean section, holds out the greatest hope for improvement in results. The results of abdominal surgery on patients who are thoroughly toxic and whose power of excretion is reduced to a minimum will ever be such as to render cesarean section a proper routine operation for all cases, but there are certain patients for whom it is undoubtedly the most conservative procedure.

Placenta Previa.—The bad results which have attended the treatment of complete or nearly complete placenta previa, when in the hands of any but trained obstetricians, have led many surgeons to recommend the performance of cesarean section in the treatment of this condition as a routine procedure, in the hope of improving the results for both mother and child. There is absolutely no doubt but that the results obtained in the treatment of placenta previa in the community as a whole are unsatisfactory, to say the least, but the underlying cause of the bad results is not the method of treatment, so much as the delay in treatment, as the following statement of facts shows. In general practice uterine bleeding suggestive of the presence of a placenta previa is treated expectantly, a positive diagnosis of the cause being rarely made. As a result the maternal mortality is very high, being ordinarily quoted as 36 per cent. The results obtained in the treatment of the same types of patients in hospital practice under the care of trained obstetric specialists present a marked contrast, the mortality varying from one to four per cent, according to the reports of different clinics, and these figures include the patients sent to the hospital in extremis as well as the cases which arise in the hospital clinic itself.

Such a discrepancy suggests what is undoubtedly true, that the gen-

eral practitioner is not equipped to deal with such an emergency as placenta previa, and either uses poor judgment in his selection of operative methods or operates unskillfully, and, therefore, loses many patients unnecessarily. While both of these hypotheses are to a certain extent true, the real underlying factor in the problem is found in the promptitude with which the symptoms which point to the existence of a serious condition are recognized and met.

In private practice the attendant is prone to neglect the warnings afforded by slight uterine bleeding and defers active measures until the occurrence of severe hemorrhage forces him to deliver a patient who is no longer in ideal condition to withstand the shock of an operation, with the result that many patients are lost who might have been saved by prompt treatment. In hospital practice and among trained obstetric surgeons the importance of prompt diagnosis of the cause of uterine hemorrhage in the latter half of pregnancy is recognized and, therefore, the majority of cases of placenta previa come to operation in relatively good condition with every reason to expect a successful outcome.

There is a distinct and increasing tendency at the present time to deliver all cases of complete or partial placenta previa by cesarean section, provided the child is definitely viable and no contra-indication, such as probable infection, is present, unless the patient is in active labor and the cervix well dilated. The results obtained by this method of treatment will of course vary to some extent with the condition of the patient when operation is undertaken, but even in patients who have lost considerable blood, this cesarean section will give results for the mother which compare favorably with those obtained by Braxton-Hicks version or the use of a bag to obtain cervical dilatation, provided the patient is transfused on the operating table, and is uninfected, while in infected cases it is probable that cesarean section followed by hysterectomy will give the best results obtainable. The advantage which cesarean section offers over other methods of delivery, is in the improvement in the infant mortality obtained when the child is viable, with no increase in the maternal mortality.

When the child is not viable there is no excuse for an abdominal delivery since equally good results for the mother can be obtained by the other methods, and there is no hope for the child in any case. Therefore a pelvic delivery is indicated rather than to enter the patient in the cesarean class in future pregnancies when there is nothing to be gained by so doing.

It seems probable also whenever a patient has lost so much blood as to be in poor condition that a Braxton-Hicks version and slow delivery combined with transfusion at the time of operation will give better results

than any other method of treatment unless the child is definitely oversized, which is seldom the case. It is undoubtedly true that in patients who have their initial hemorrhage when at or near term, and in whom examination shows a large child whose relation to the pelvis is doubtful, cesarean section is indicated as the operation of election, in case the mother is in good condition. These cases are comparatively uncommon, however, since in the great majority of cases the initial hemorrhage in complete placenta previa occurs before the eighth month of pregnancy at a time when only extreme pelvic contraction would result in disproportion between the child and pelvis.

It is not possible to state positively how great a saving of fetal life will result from the routine employment of cesarean section in complete and partial placenta previa. Approximately one-half of the cases have sufficient hemorrhage to call for prompt action before the child is viable, and the child cannot be saved in these cases by any method of delivery, while in a certain number of cases the child is sure to die of prematurity even though it may seem to have a chance at birth. If, however, the results of cesarean section show an improvement in the fetal mortality of only a small percentage, the operation is justified as long as the maternal mortality shows no increase, and this, according to the statistics published by competent operators, would seem to be the fact.

In the hands of the general profession, however, owing to a lack of appreciation of the necessity for prompt delivery following the first hemorrhage in placenta previa, and a less well-developed aseptic and operative technic, it is probable that the results of cesarean section will prove worse for the mother and little if any better for the child than the other methods of delivery, and the routine adoption of cesarean section in these cases is hardly to be advocated in general practice, especially since a careful selection of the cases fit for the operation is hardly to be expected, except among well-trained obstetricians.

The classical cesarean section, followed or not by hysterectomy, is the operation of choice in placenta previa. The low cervical operations have no place in this condition, since the low incision, opening the enlarged blood vessels at the placental site, situated as they are in the non-contractile lower uterine segment, is sure to result in excessive hemorrhage which may easily prove fatal.

Premature Separation of the Normally Situated Placenta.—Concealed or accidental hemorrhage is one of the most dangerous complications of pregnancy and labor, practically all of the children, and, according to Goodell, 50 per cent of the mothers being lost. If the hemorrhage is mostly external, the prognosis is largely dependent on the amount of blood lost, but the fact must be borne in mind that comparatively slight

external bleeding may be accompanied by serious intra-uterine hemorrhage, and any patient in whom the symptoms of hemorrhage are out of proportion to the amount of external bleeding should be looked on as an emergency for whom delivery is urgent. It must be remembered also that in a certain number of these patients the uterine musculature is practically disintegrated by the hemorrhage into it, and that after delivery these patients may die from postpartum hemorrhage, due to the atonic condition of the uterus, while in other cases a degree of unrecognized intraperitoneal hemorrhage occurs before and after delivery which is sufficient to prove fatal, unless checked by the removal of the uterus.

In severe cases the mother can only be saved by a prompt emptying of the uterus, which should be accomplished by the method which seems to be most conservative for the individual case. In patients in whom labor has begun and is going on in a satisfactory manner, so that the cervical canal is obliterated and the os partly dilated, the case may be left to nature, unless the symptoms are urgent, although careful observation should be maintained in order that an increase in the amount of the internal bleeding may be met by prompt delivery. In the great majority of cases, however, the placental separation occurs before labor begins and cesarean section offers the most conservative method of delivery, since it not only involves less shock than a prolonged manual dilatation followed by version, but it also affords the operator an opportunity to inspect the uterus and to remove it, if it is found to be so atonic from disintegration of its musculature due to hemorrhage into its substance that postpartum hemorrhage is probable, or if bleeding is going on into the peritoneal cavity. In all cases in which the uterus has taken on the ligneous feel, which is so characteristic in these cases, abdominal delivery is the most conservative treatment, even though the cervix is partly dilated, on account of the freedom of action which it affords, since the uterus can be removed or conserved at will after careful inspection. In the same category should be placed the exceedingly rare case in which rupture of a uterine varix occurs during pregnancy or labor. Cesarean section in premature separation of the placenta due to toxemia is sure to be accompanied by a relatively high maternal mortality, since the kidneys are not infrequently so severely damaged by the toxic process that recovery is impossible and the patient dies of uremia, although apparently doing well from an operative standpoint. These cases are hopeless irrespective of the method of delivery. Aside from this complication cesarean section in my opinion offers much the safest means of delivery.

Cardiac Complications of Pregnancy.—Heart disease complicating pregnancy and labor offers a wide field for the employment of cesarean section. In these cases we have an opportunity, not only of saving the

patient's life in the immediate present by substituting the short strain on the heart involved in a laparotomy for the prolonged strain of labor, but also of preserving her health in many cases and preventing her from becoming a cardiac invalid for at least a considerably longer period than would otherwise be the case. The strain of pregnancy has been thoroughly demonstrated to be so serious in patients with cardiac lesions that pregnancy is recognized as contra-indicated in severe cases, and the strain of labor has an even more harmful effect. It is, therefore, important for these women, if they attempt to have children, that they should be safeguarded by every possible means, and that delivery should be made as easy as possible for them and should involve as little strain on the heart as possible, in order to minimize cardiac damage to the utmost.

VALVULAR LESIONS.—It has long been recognized that patients suffering from certain valvular lesions of the heart stand pregnancy badly in many instances and are apt to die during or after labor, or at the best be left more or less permanently invalidated. The prognosis is so grave in certain cases of mitral stenosis, alone or combined with other lesions, that some authorities consider abortion justifiable as the only sure method of avoiding serious cardiac damage. Aortic lesions come next in order, while mitral regurgitation is relatively mild in its effects. In all cardiac patients the most conservative advice would be undoubtedly that pregnancy should be absolutely avoided, since the increased work thrown on the heart during pregnancy exhausts its reserve to some extent and, therefore, ultimately must shorten the patient's life, even if it does not leave her a cardiac invalid. The effect of labor on such a heart is even more serious and many patients die or are left as cardiac invalids as a result of a labor which has been conducted without regard to their needs.

The problem that confronts the obstetrician is a difficult one when such a patient comes to him for care, since she has been placed in a position which inevitably involves a lowering of her cardiac reserve to some extent, and, which, even if it does not produce immediately serious consequences, is sure to cause some permanent damage, which can only be minimized by extreme care during pregnancy and by the adoption of the method of delivery which involves the least strain on the heart.

As a general rule it may be said that any patient with mitral stenosis or an aortic lesion who has at any time suffered from cardiac decompensation, no matter how slight, should be looked on as a bad risk for labor and as in a serious condition throughout pregnancy. She should be treated as an invalid throughout pregnancy, kept under most careful observation, and delivered by cesarean section at the time of election, in the hope of reducing the amount of cardiac damage to a minimum: and in order to prevent her from taking similar risks in the future, it is

distinctly advisable that she should be sterilized at the time of the operation. The fact that the heart has decompensated at some time is absolute evidence that the patient is in a precarious condition and should receive the most careful attention.

Any primipara with mitral stenosis or an aortic lesion should be delivered by cesarean section, even though she may never have had a failure in compensation, in order to minimize the depletion of the cardiac reserve, since in many cases prolonged or permanent invalidism has followed labor, even though it was not unduly difficult. Sterilization is not necessarily indicated in these cases unless the patient requests it, since if the patient has developed no cardiac symptoms during pregnancy and desires other children, she may be allowed to have them, on the understanding that each successive pregnancy will lessen her cardiac reserve to some extent and therefore shorten her life, although practical invalidism during pregnancy and cesarean section at term will reduce the damage to a minimum. Patients suffering from mitral regurgitation are in much less serious danger, and if the heart has never shown any signs of decompensation, may be allowed to go into labor, the second stage being cut short by early operative delivery.

Multiparae with well compensated mitral stenosis or aortic lesions may be allowed to go into labor, since the strain of the usually short first stage will not as a rule throw an undue strain on the heart. They should, however, be carefully watched, and, if any sign of cardiac failure occurs, should be delivered promptly by the most conservative method, which will probably be cesarean section, if the cervix is at all rigid and only partly dilated. If the patient has at any time previously had signs of decompensation, cesarean section at the time of election will prove in many cases a life saving procedure.

MYOCARDITIS.—The condition of the heart muscle is even more important than the presence of a valvular lesion, and patients who are believed to be suffering from myocarditis, whether acute or chronic, are better risks for cesarean section than for labor, since a prolonged difficult labor not infrequently results in acute cardiac dilatation, which is always serious and may prove fatal. These patients often suffer from symptoms due to a lack of cardiac response during pregnancy. Most of them are flabby muscularly and anemic, owing to their inability to take sufficient exercise in the open air to keep up their general condition, due partly to cardiac discomfort and partly to the necessity of throwing no avoidable strain on the heart. Shortness of breath is common, and the heart action is often irregular, the pulse often varying from 20 to 50 beats on minor exertion, although the heart sounds are normal. These

cases are very common following acute infections, such as influenza, occurring during pregnancy, the burden of pregnancy preventing the heart muscle from being restored to its normal condition, since the complete rest of the heart necessary to accomplish this cannot be obtained owing to the increasing burden which pregnancy throws on the heart. Cesarean section in these cases affords a means of preventing a strain on the damaged muscle, which may cause permanent damage, and thus will often prove a health saving, if not a life saving procedure.

Poor Physical Equipment.—Closely analogous to the patients who present an actual myocarditis, are the patients who are physically poorly equipped for the burden of labor, although they show no actual lesions to attract the attention of the obstetrician. They are usually frail, anemic women, and the history of the past life suggests that, although perhaps never actually sick, they are never actually well. In these women the burdens of their ordinary life seem to be all that they can bear, and although never actually breaking under the strain, the break seems always imminent. These patients usually react badly to pregnancy and do not improve in physical condition as pregnancy goes on. If such women are subjected to the strain of a hard labor, they are often left in such an exhausted condition that a prolonged period of invalidism follows, and they may never regain their normal, though feeble, health. Cesarean section offers to such patients a means of conserving energy which is vitally important to them and should be seriously considered in women of this type as a means of avoiding the chronic ill health that is so often induced by a labor of not more than average severity. Undoubtedly the immediate risk to life is slightly greater than that of delivery by vagina, but the advantages to be gained as regards future health by a slightly increased risk to life are very real.

Poor Nervous Equipment.—Closely related to these patients, and yet in a different group, are the patients whose nervous equilibrium is unstable, women whose past history shows a lack of resistance to the nervous influences of their environment. It is not uncommon to find patients, a large part of whose adult life has been spent in taking rest cures for nervous exhaustion, fancied or real, whose margin of safety from a serious nervous collapse is extremely small. Such women are very prone to respond badly to the strain of labor, and to them pain is a real evil. They represent in our civilized communities a type which would have been largely eliminated, if medical care had not interfered with the law of the survival of the fittest. Experience leads me to believe that, if this type of patient is subjected to the strain of pregnancy, and especially of labor, neither she nor her physician of the moment

will cease to regret it. I say advisedly "physician of the moment," because she wanders from doctor to doctor in search of mental health which cannot be given. If such a patient is allowed to go into labor, it may be months or years before she recovers from the shock to her nervous system, and a prolonged attack of nervous prostration is often the sequel. These women fortunately stand the shock of an operation remarkably well as a rule. What they cannot recover from is a long strain, particularly if much pain accompanies it, and all pain is exaggerated to them. They seem to react especially well to cesarean section, which, by eliminating the pain of labor as well as relieving them of the burden of pregnancy, leaves them in a peculiarly favorable condition for recuperation, at least in part, and they often leave the obstetrician's care in better condition than he found them in, if treated in this way.

It may seem radical to urge a major operation to avoid nervous strain, especially to those who do not meet this type of patient in their local communities; but I am satisfied that these patients are the abnormal product of an overcivilization and are much like hothouse plants and must receive special treatment. If they are treated as ordinary patients, the results are seldom satisfactory to either doctor or patient.

Elderly Primiparae.—It is very common to hear of patients who, being pregnant for the first time in the late thirties or early forties, have been allowed to go into labor which has proved unsatisfactory, and have then been subjected to a brutal pelvic operation, with the result that the child is lost and the patient so badly lacerated that secondary operation has been necessary to restore her even partially to health, the time lost sometimes precluding the possibility of another pregnancy, so that she is thus left childless. This policy is a relic of traditional obstetrics, which presupposes that any woman who becomes pregnant must have her child in the natural way, and works a very grave injustice to a class of women to whom one living child represents all that they can ask for. I am far from advocating that every elderly primipara should be delivered by cesarean section, but I do believe that the ordinary rules which govern the choice of method of delivery should be widely extended in these cases, and that if, after careful examination, any abnormality can be found, if the head remains high, even though the pelvis is normal, or if the soft parts are sufficiently rigid to suggest the probability of serious laceration, the patient should be given the opportunity of having a cesarean section if she so desires, the increased safety to the child and the avoidance of laceration being the principal advantages to be gained. If it is decided to allow such a patient to go into labor, the progress should be carefully watched, and if the uterus functions improperly or

if the cervix does not dilate as it should, prompt delivery by section is indicated. Manual dilatation, followed by forceps or version, in these cases offers so great an increase in the risk to fetal life and maternal health that cesarean section is a conservative operation by comparison, and its performance will save many such women from prolonged ill health and from the regrets of a childless old age. According to statistical evidence the fetal mortality in primiparae of forty or over is approximately 10 per cent. This fetal mortality taken into consideration with the pelvic damage which results in a much larger proportion more than justifies the choice of cesarean section as the elective method of delivery.

Cesarean Section to Prevent Pelvic Damage Following Operations for Repair of Previous Injury.—It not infrequently happens that women who have suffered serious laceration in previous labors and have undergone extensive operations for repair of the injuries again become pregnant, and the question arises as to how such patients should be delivered, in order to give the best possible results. Certain facts are evident. The normal vaginal tissues have been largely replaced by scar tissue as the result of the operation, and are less likely to stretch well during delivery. In addition, the patient has suffered sufficiently from the lesions caused by the previous labors to be willing to undergo an extensive operation for repair, and the probability is that delivery per vaginam will result in damage at least as serious and possibly more so than occurred in the previous deliveries.

The principal factors to be taken into consideration in such cases are the nature of the injury in the previous labor, the amount of scar tissue and the degree of softening which it undergoes under the influence of the increased congestion of pregnancy, and the degree of inconvenience suffered by the patient before being operated upon. If the previous labor resulted in injury to the bladder or rectum, the danger of recurrence with the possibility that a satisfactory result may not be obtained at a second operation warrants the performance of a cesarean section.

If the previous damage has resulted in prolapse of the vaginal walls with cystocele and rectocele and possibly prolapse of the uterus, the extensive operation for repair necessarily leaves a large amount of scar tissue in the vagina. If this scar tissue becomes succulent and softened during pregnancy, there is a fair chance that a pelvic delivery may occur without serious damage, but if the patient's health has suffered severely during the interval between the laceration and the operation for repair, it will be wiser, in most cases, to deliver the patient by section rather than subject her to a possible recurrence of the ill health, which can be relieved only by a secondary operation, which may or may not

prove a success. If the scar tissue remains rigid in spite of the increased congestion, it is almost certain that serious laceration will occur if pelvic delivery is attempted, the repair of which may not prove a success, and delivery by cesarean section offers the best method of delivery when all factors in the problem are considered.

It cannot be claimed in these cases that cesarean section is at all a necessary operation for delivery, but that it is the wiser course when everything is taken under consideration, since it is a good working principle in obstetrics that abnormal patients are best treated in an abnormal way, and that the attempt to treat them as if they were normal will meet with disaster in many instances. The preservation of health is only secondary to the preservation of life, and when health can be practically promised at a slight increase in the risk to life, that risk is worth taking.

Cesarean Section in Malpositions of the Fetus.—Within the last few years certain writers have advocated cesarean section in almost all cases in which the fetus presents in any other way than by the vertex. Breech, face, and transverse presentations have all been cited as being indications for cesarean operation, largely, it seems to me, because it is an easier method for the operator and requires less technical skill and judgment for successful delivery.

It is perfectly possible that cesarean section may prove the best method of treatment in many of these cases, but the indication is the cause that produces the malposition rather than the malposition itself, considered in relation to the other conditions present in the given case.

BREECH PRESENTATIONS.—In primiparae breech presentations have a bad reputation, owing to the difficulty of determining whether the size of the fetal head is out of proportion to the maternal pelvis, and to the fact that the proper care of breech presentations involves a degree of judgment as to when or whether extraction should be undertaken, and so much skill in its performance that an average fetal mortality of 10 per cent occurs. This mortality is much less in skilled hands, since it is largely due to unwise attempts at delivery, through an imperfectly dilated cervix. If the breech is not in the pelvis at the beginning of labor, and if the baby is unusually large, or if the pelvis is contracted, cesarean section may properly be considered, but the indication is not so much the breech presentation as the other factors which are present in the case, such as disproportion between the child and the pelvis, early rupture of the membranes, and unsatisfactory dilatation of the cervix.

In multiparae cesarean section is practically never indicated for breech presentations per se in the absence of other indications.

FACE PRESENTATIONS.—Primary face presentations occurring in primiparae almost always indicate sufficient disproportion between the head and the pelvis to warrant the belief that some obstruction exists which prevents the entrance of the head into the pelvis. Careful examination, especially under anesthesia, will reveal the facts, and cesarean section may very properly be the indicated procedure, if such disproportion is marked. If, however, as is usually the case, the face presentation develops during labor, the problem is not so clear. Even in these cases there may be definite disproportion in cases in which the head remains high and does not enter the pelvis and the proper treatment can only be determined by careful examination. If the face seems to be entering the pelvis, a moderate test of labor should be given, the progress being followed by rectal examination. If progress is unsatisfactory, especially in posterior positions of the face, examination under ether will indicate the proper treatment, but if good progress is made, a pelvic delivery is indicated.

In multiparae, whose previous obstetric history is normal, a face presentation is seldom or never a complication which will call for abdominal delivery.

TRANSVERSE PRESENTATIONS.—Transverse presentations in primiparae, except in multiple pregnancies or hydramnios, are an indication of sufficient pelvic contraction to warrant the assumption that cesarean section is probably the best method of delivery, since the disproportion between the head and pelvis is usually marked in these cases. Furthermore, an operative delivery is necessary in all cases at term and the danger to the life of the child and the soft parts of the mother is sufficient to cause anxiety on the part of the attendant. Both patients, therefore, have an improved prognosis in abdominal delivery.

In multiparae with a normal obstetrical history cesarean section will seldom be the operation of choice and practically never, on account of the malposition, if uncomplicated by other conditions which may indicate an abdominal delivery.

Postmortem Cesarean Section.—Although cesarean section was originally employed, at least as far as authentic records show, for the purpose of delivering women who died in the latter portion of pregnancy, either in the hope of obtaining a living child, or so that mother and child might be buried separately, it is at present comparatively rarely performed. The latter indication, i.e., the separate burial of mother and child, seems to have lost its force under the Christian era, and the operation is now performed only occasionally on the dead and then for the sake of possibly preserving the fetal life.

Living children have been delivered up to one hour after the mother's

death, and, therefore, it would seem, theoretically at least, as if some attempt should be made to save the child, in case of maternal death, after the period of viability has been reached.

Experience has shown, however, that in cases of maternal death, accompanied by gradual respiratory failure, as in pneumonia, or after a lingering illness, the death of the child precedes that of the mother by a considerable interval, owing to interference with its supply of oxygen, and that the operation is useless in such cases. If, however, the mother dies suddenly, as for instance from heart failure, or as the result of an accident, the chance of obtaining a living child by operative means should be taken.

One fact, however, must be borne in mind, and that is, the possibility that the diagnosis of death may be a faulty one and that the patient may, in rare instances, recover. This possibility makes it incumbent on the operator to take adequate, though perhaps hurried, aseptic precautions, even at some risk of inviting failure, to avoid the somewhat remote but possible contingency of saving the child at the expense of the mother's life, in case the diagnosis of death should be erroneous. Aseptic preparation of the patient and operator should, therefore, be made, if proper facilities are at hand, so that the mother may not recover from apparent death to die of infection.

Such a patient may very properly be delivered by cesarean section, if conditions proper for the operation are available, and the complete operation should be performed, the uterine incision being sutured just as in the ordinary operation.

If it is not possible to provide for a properly aseptic laparotomy, it is advisable that the operation should not be undertaken, and some authorities feel that, even though such provision is made, a rapid dilatation of the cervix, followed by version and extraction, is the preferable method of delivery. The tissues of a patient shortly after death are usually so relaxed and flabby that delivery from below may be expected to be accomplished as rapidly as abdominal delivery. This method has the advantage of being less likely to do harm in case the diagnosis of maternal death is incorrect, unless full aseptic precautions are observed in the abdominal delivery; but in cases in which marked cicatricial changes are present in the cervix it may prove difficult and cesarean section be distinctly the better procedure.

Abdominal Abortion.—By the term abdominal abortion I refer to the termination of pregnancy before the period of viability is reached, by abdominal hysterotomy, rather than by the more usual methods of performing abortion. This operation may be indicated in any case in

which abortion is urgently demanded by some serious maternal complication and in which sterilization is considered indicated to protect the patient against the dangers of future pregnancies.

This operation is most often indicated in patients who are suffering from cardiac lesions which have resulted in decompensation at some previous time, either when the patient was not pregnant, during previous pregnancies, or in the early months of the present pregnancy, and who are showing symptoms of a fresh decompensation. In these cases the cardiac condition is often such that it seems probable the patient either may not survive the present pregnancy, or that, if she does, she will be left a cardiac invalid during the remainder of her life, and that another pregnancy is almost sure to prove fatal. The choice of operation depends on the patient's condition at the time and on the fact that pregnancy should never be attempted again.

If the patient's condition is so precarious that all possible shock must be avoided in terminating the pregnancy, it is a moot question whether or not delivery from below, under spinal anesthesia, will prove a slightly safer operation; but such an operation only partially meets the indications in these cases, since it leaves the patient in a condition in which there is danger of future pregnancies, even though great care may be used to avoid conception. For the complete protection of the patient sterilization is necessary, and this can best be accomplished by laparotomy.

If the patient is in fair condition at the moment, the best treatment is laparotomy, removal of the ovum through a uterine incision followed by sterilization, or supravaginal amputation of the uterus without incision, as may be deemed advisable. As a rule, however, the latter operation is more severe and carries with it somewhat greater shock than the former, although the difference is not great.

In patients with chronic nephritis who give a history of repeated miscarriage or premature labors with dead children abdominal abortion and sterilization is a justifiable procedure. In these patients the chance of a living child is very slight, since the previous misfortunes are directly dependent on a chronic disease which is steadily increasing, and each attempt at pregnancy increases the renal damage to some extent and leaves the patient in a worse condition than before, thereby shortening her life without giving her the satisfaction of a child. Such patients should be protected against the inevitable damage of repeated attempts at pregnancy, as well as against the present one, and this can be accomplished by a single operation, unless the patient's condition is such that laparotomy is considered too dangerous.

To summarize briefly: whenever the patient's condition is such that

abortion is urgently called for and the attendant feels that the indication against pregnancy is a permanent one, the desired result is best accomplished by termination of the pregnancy, and sterilization at a single operation, unless the patient's condition is so precarious that it is felt that termination of the pregnancy is all that should be attempted, and that the question of sterilization should be left for the future in case she recovers from the abortion.

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CHAPTER VI

CONTRA-INDICATIONS TO THE ELECTIVE CESAREAN SECTION

Definition of Elective Cesarean Section—The Absolute Indication—The Elective Operation vs. Operation at the Time of Election—Best Time for Operation—Fundamental Principles Governing the Operation—Conditions Increasing Danger to Maternal Life—Infection—Exhaustion—Attempts at Pelvic Delivery—Infectious Diseases—Surrounding Conditions—Training of the Attendant in Relation to Choice of Operation—Bibliography.

By the term "elective cesarean section" we mean the performance of cesarean section to accomplish delivery when the conditions present in the given case are such that, although it is possible to deliver the patient per vaginam, cesarean section is selected as the preferable operation for the individual patient.

In cases of pelvic contraction so extreme that the extraction of the child cannot be accomplished, even after craniotomy, or when the pelvis is so obstructed by tumors that delivery per vaginam is impossible, the indication for abdominal delivery is absolute, but in most other conditions the obstetrician has at his command various methods by which delivery is possible, and the abdominal delivery becomes an elective procedure. Some operators go so far as to say that, if the choice of any other operative procedure involves the destruction of a living child, the indication for cesarean section becomes absolute, no matter what risks it may involve for the mother, but, in my opinion, cesarean section is under certain circumstances too dangerous an operation for the mother to be undertaken, and I believe that the destruction of a living child is still justifiable in certain cases of neglected labor, and is preferable to cesarean section followed by hysterectomy, unless the risks of the pelvic operation are considered practically equal to those of the abdominal delivery.

In using the term "elective cesarean section" care must be taken not to confuse it with "cesarean section at the time of election." By the latter term we mean the performance of cesarean section, the advisability of which has been already determined, at the time when better results for the mother and equally good results for the child are to be expected than if the operation is performed at any other time. It is to-

day very generally agreed that, if the operation be performed shortly before the estimated onset of labor, or within a few hours after labor has begun, the interests of both patients are served to the highest degree, and that the results of operation at this time will be more nearly ideal than at any other time. The definition of elective cesarean section has already been given.

Certain fundamental principles underlie the success or failure of any surgical procedure, and although under certain circumstances there may be no alternative but to perform the operation in violation of these principles, the results in general will be such as to prove the wisdom of not departing too widely from them when any liberty of choice exists.

From time to time series of cases are published with the apparent object of proving that the principles which govern success in cesarean section may be disregarded with impunity, at least by certain surgeons; but in one such instance it has been my privilege to follow the subsequent work of the author of one of these papers, and it is sufficient comment to say that he has not published the results of his more recent operations, and that those who have followed his lead have not published their results at all.

It must never be forgotten that cesarean section is a major abdominal operation, and that a disregard of the conditions which render abdominal surgery safe will sooner or later bring its own reward. Although the occasional operator may escape, for a time at least, the logical penalty of disregarding surgical principles, the net results of reckless operating will show so high a mortality as to prove the danger of not following the rules which determine the safety of any surgical procedure.

At the present time cesarean section is recognized as an operation of election for the preservation of fetal life or maternal health. If undertaken under proper conditions and in selected cases, it is only slightly more dangerous than any other clean abdominal operation. If the conditions which render abdominal surgery in general safe are not fulfilled, at least to a great extent, cesarean section should not be undertaken unless it is the case that any other possible procedure carries with it a practically equal risk to the mother, in which case the preservation of the child may properly prove the determining factor. Being an operation for the preservation of fetal life, it is seldom indicated in cases where the child is known or believed to have perished, except when no other method of delivery is possible, unless the conditions present in the given case render it the safest operation for the mother. If the conditions present lead to the conclusion that, although a living child may be obtained, the mother's life will probably be sacrificed, cesarean section

becomes an unjustifiable procedure, since the maternal life should always be considered as the more important, if choice is possible. Religious scruples on the part of the patient or surgeon may occasionally necessitate the performance of cesarean section under conditions which do not give the mother a fair chance for her life, but in the great majority of cases it may be fairly said that no operation is permissible to save the child which is believed to seriously endanger the mother, when any other operation can be performed which will increase the safety of the mother, even though it may involve the loss of the child.

There are certain conditions which enter largely into the determination of the degree of danger to the mother in any given case, and it is of the utmost importance that these conditions should be recognized and be given careful consideration in the choice of operation. The great majority of patients who present indications for cesarean section can be divided into two distinct groups, the favorable and the unfavorable.

For a patient to be classed as favorable certain conditions must be fulfilled: (1) There must be no suspicion of uterine infection. (2) She must not show signs of exhaustion, whether general or uterine, from any labor which may have occurred. (3) The membranes shall have been ruptured not more than five or six hours, and either no vaginal examinations have been made, or not more than one or two at the most and these under full aseptic precautions. (4) There must have been no attempts at operative delivery from below. (5) There must be no sign of intercurrent infectious disease. (6) She must be so situated that it is possible for the operation to be performed in a properly equipped hospital, or else hospital conditions must be reproduced in the home, and efficient after care must be provided for.

The converse of any of these conditions renders the patient at least a relatively unfavorable risk for cesarean section, and although, under certain circumstances, cesarean section may still be elected as the operation which will on the whole give the best results, the outcome of the operation is more doubtful than if no unfavorable conditions were present, and the prognosis must be stated accordingly. It may be that the patient will prefer not to submit to an operation which carries with it a considerable risk to her life for the sake of a living child, and her preferences must be given adequate consideration, especially if she has other children, since her life is much more important than the life of the child.

Uterine Infection.—That definite uterine infection should be an absolute contra-indication to cesarean section, unless the operation is completed by removal of the uterus, is generally conceded, since the retention of the infected uterus often results in fatal peritoneal infection,

no matter whether a classical or extraperitoneal operation be performed. Some operators attempt to treat these cases by the extraperitoneal or low cervical method operation, but the results are not sufficiently good to warrant the risk in frankly infected cases, although in doubtful cases the operation may be justifiable. A certain proportion of infected patients undoubtedly recover from cesarean section after a stormy convalescence, but the mortality is so great that the conservative operation is absolutely contra-indicated in the presence of frank infection, and an abdominal delivery should never be performed under these conditions when any other method of delivery is possible. If, however, cesarean section seems to be the only available method of delivery under such circumstances, supravaginal amputation of the uterus should always complete the operation, and the infected uterus should never be replaced in the abdomen to act as a source of peritoneal infection.

Patients who have been repeatedly examined during labor, even under strict asepsis, are relatively poor risks for cesarean section, since each examination increases the risk of uterine infection, and if the asepsis has been poor or doubtful the risks of the conservative cesarean section are much increased, even though no signs of infection are evident, since it is almost certain that infective organisms have been introduced into the uterine cavity in such cases, and contamination of the peritoneum or infection of the uterine wound is probable. In cases of this nature an extraperitoneal or low cervical operation will give, as a rule, better results, though if it is possible to avoid abdominal delivery altogether and deliver the patient by some other method, this should be done, unless the child is in excellent condition and cesarean section seems to offer the only chance for its life. Even then, unless the parents elect to run the increased risk for the sake of preserving the life of the child, with full knowledge that it may mean the life of the mother, the operation is an improper one. If the child is not in first rate condition, a destructive operation is preferable, unless extraction of even a mutilated child is impossible on account of pelvic obstruction.

In the same category should be placed patients in whom the membranes have been ruptured for a considerable period. It is a well recognized fact that premature rupture of the membranes predisposes markedly to infection of the amniotic cavity and in some cases to uterine infection. Slemons has shown that infectious organisms not infrequently invade the placenta and are transmitted to the fetus, causing its death by septicemia, either before or a few days after birth. It is evident, therefore, to what danger of peritoneal infection a patient is exposed when under such circumstances she is subjected to an abdominal delivery, since it is very difficult to avoid infection of the surrounding tissues when the

uterus is opened. The wonder is not that the results are bad, if the membranes have been ruptured more than a few hours, but that any patients survive. The low cervical operations give somewhat better results under these conditions, proving that infection at the time of operation is less important than leakage through the uterine wound at a later period, but the risk to the mother is too great to warrant the operation, if any other procedure is possible.

Patients in whom attempts have been made to induce labor by means of a bag or bougie, or in whom serious attempts at pelvic delivery have been made by operative means, are also bad risks for cesarean section. There is always sufficient risk of uterine contamination under these conditions to contra-indicate a classical cesarean section, unless followed by hysterectomy, and although an extraperitoneal operation would involve less risk, it is, in my opinion, a doubtful procedure. I personally prefer in such cases to accomplish the delivery per vaginam, if possible, even though it may involve a destructive operation on a living child. The proper time for cesarean section is before the uterine cavity has been infected by repeated manipulations, and the mortality and morbidity which attend cesarean section after attempts at pelvic operative delivery are such as to contra-indicate it when any other method of delivery is possible.

Exhaustion.—The element of exhaustion, as a contra-indication to the elective cesarean section, should receive careful consideration in every patient who has been in labor for any length of time, since it is evident that an exhausted patient is a much poorer subject for abdominal surgery than a patient in good condition, and the mortality and morbidity will be distinctly higher, the greater the degree of exhaustion present, the patient's lowered resistance making even a low grade infection serious.

Exhaustion in its relation to rendering a patient unfit for abdominal delivery must be considered from a dual standpoint, i.e., general exhaustion from prolonged or excessive labor, and exhaustion of the uterus as evidenced by increasing rigidity or by irregularity of the previously regular contractions.

That general physical exhaustion renders the prognosis of abdominal surgery worse needs little comment, since it is evident that the lower the patient's vitality the poorer her chance of standing a major operation well, and cesarean section should always be avoided when any other means of delivery is possible in these cases. This is particularly the case since the vitality of the child will have suffered to a considerable degree, and serious risks should not be taken for the mother for the sake of a child whose chances of survival are doubtful.

Exhaustion of the uterus should also be considered as markedly in-

creasing the risks of abdominal delivery, and although in patients who have developed signs of uterine exhaustion resulting in rigidity of the uterus, a thinning out of the lower segment, and a rising contraction ring, cesarean section may seem to be indicated as the most conservative procedure under the circumstances, owing to the imminent danger of uterine rupture, if operation is attempted from below, the operation will have a relatively high mortality and morbidity. Hysterectomy in these cases will improve the patient's chances materially, although the substitution of an extraperitoneal operation for the classical one is justifiable, unless the patient is believed to have been already infected, and will give somewhat improved results.

Intercurrent Diseases.—It may be laid down as a general principle that acute infectious diseases render the prognosis of cesarean section so doubtful as to contra-indicate its performance as an elective procedure. The danger of infection of the uterine wound, with the subsequent infection of the peritoneal cavity, is so much increased in these cases that operation should be avoided whenever possible.

The toxemias of pregnancy have already been discussed as indications for the operation, but it may be well to consider them briefly from the opposite standpoint. Preëclamptic toxemia is a condition of lowered vitality with diminished excretions. Furthermore there is a certain amount of evidence that one of the factors in the production of toxemia may be concealed sepsis, and blood cultures in toxemic women are reported to show a positive growth in a considerable proportion of cases. We have then in these cases two factors which increase the dangers of abdominal operations, auto-intoxication and possibly septicemia.

The two most important objects sought in the treatment of toxemia are: first, the removal of the ultimate cause of the disease—the child—and thus the prevention of the further absorption of toxins; and second the removal of the toxins which produce the symptoms. The major portion of the toxins is presumably excreted through the intestinal tract, and it is well known that it is often very difficult to secure free catharsis for several days after cesarean section. It is evident, therefore, that if the patient has retained in her blood any considerable amount of a virulent toxin, the excretion of which is interfered with by the intestinal paresis following an abdominal operation, the prognosis of the operation will be worse than in a normal patient, and also that the danger from the toxemia may be increased to some extent, owing to lack of prompt elimination of the toxins. These dangers may not nullify the other advantages of cesarean section in the given patient, but they alter the prognosis for the worse, and cesarean section should not be selected as

the routine method of delivery for every toxemic or eclamptic patient, but only when careful examination of the patient shows that other methods of delivery possess even greater disadvantages and section is, on the whole, the less dangerous method.

Chronic nephritis or other chronic diseases must also be considered as altering the prognosis of cesarean section somewhat for the worse, but if any valid reason exists for the performance of abdominal delivery in these cases, it should be performed without hesitation, although the results will show a somewhat increased mortality and morbidity over what is to be expected in women in a normal condition of health.

Acute nephritis from any cause will alter the outlook materially for the worse, and although in toxemia and other conditions which produce acute nephritis the operation may be indicated, the results will not be as satisfactory as in normal women, and abdominal delivery should be avoided, if possible.

In other words any condition which results in lowered vitality and resistance on the part of the patient offers a relative contra-indication to cesarean section, and its performance, under such conditions, is only justifiable when the advantages to be gained more than compensate for the increased risk.

Surrounding Conditions.—There can be no doubt but that the circumstances under which the patient is placed and the surgical skill at her command, as well as the means for proper after care, should have a serious influence on the choice of operation.

The conditions which appertain to a first class surgical hospital, combined with first class surgical skill on the part of the attendant, will do most to ensure a successful result, and the more nearly the circumstances of the patient can approximate these, the better the prognosis. A good result may ordinarily be predicted, however, if the patient's surroundings are such that the ordinary aseptic precautions can be observed during the operation and efficient after care provided for during the convalescence. Unless these conditions can be fulfilled, the patient will have a better chance of recovery after a difficult pelvic delivery than after a laparotomy, and this fact should receive due consideration in the choice of operation, even though it is recognized in advance that a pelvic delivery will probably involve the loss of the child.

Cesarean section has been performed successfully in a farmhouse by candle light and without trained assistants, but a single successful case does not warrant our choosing improper surroundings for our patients when more or less ideal conditions can be obtained. Serious surgery under improper conditions is sure to be attended by a much higher

mortality than if good hospital conditions can be provided, and a room in a tenement house is not a satisfactory operating room. If, therefore, hospital facilities are not obtainable, or to be reproduced in the patient's home, cesarean section should not be elected, if any other operation can be done with due regard to the safety of the mother.

Efficient after care is necessary after any abdominal operation, to ensure first, the safety of the patient, and second, her comfort. Trained nurses are obtainable at the present time in most communities, even where there are no hospital facilities, but if it is not possible to provide for proper after care, cesarean section should not be performed when any other operation is possible.

The surgical skill at the command of the patient is another factor which must enter into the choice of operation. If the attendant has had no surgical training and no trained surgeon can be procured, cesarean section should only be considered as an operation of last resort. Although a classical cesarean section is not an operation of great technical difficulty, and in fact is much easier than any but the simplest obstetrical procedures, safety in its performance demands a thorough knowledge of asepsis, which the average physician not trained in surgery does not possess. Any failure in asepsis in abdominal surgery is liable to prove much more serious than in pelvic operating, since the patient whose peritoneum is infected has little or no chance to overcome the infection, whereas the patient with puerperal infection will, in the great majority of cases, recover, if properly treated. On the other hand, it must be remembered that, although the conservative cesarean section is a simple procedure, it may be necessary in any case to remove the uterus for uncontrollable hemorrhage or on account of previous infection, an operation which requires a surgical training for its proper performance. It is fair to say, therefore, that cesarean section is an operation which should not be undertaken by any operator, unless his training is such as to enable him to carry the operation to its logical conclusion, no matter what complications may arise.

If the attendant or consultant happens to be a trained abdominal operator and yet has had no proper training in obstetric operating, it is conceivable that conditions may arise which will warrant his performing a cesarean section under circumstances in which a pelvic operation would ordinarily be indicated for a properly trained obstetrician, since his special training has fitted him to perform one operation, but not the other, and the patient's chances will be better if he does the operation he is qualified to perform, other things being equal, rather than if he attempts an operation with the technic of which he is unfamiliar. How-

ever, unless the case is an emergency one and the time necessary to summon a properly trained obstetric consultant may mean the life or death of the patient, he is not justified in operating, since it is probable that his judgment as to the needs of the patient will prove just as faulty as his ignorance of obstetric operating is profound, and he will probably perform an operation which not only is unnecessary under the circumstances, but which also exposes the patient to a much greater risk than is proper, simply because in his ignorance of obstetrics he is not qualified to effect delivery, except by the abdominal route.

There is no question but that many cesarean sections are performed every year simply because the consultant called to the case has no knowledge of obstetric diagnosis and technic. He sees a patient whom the family physician has failed to deliver, and, without the proper knowledge to determine what the patient really needs, he empties the uterus by the abdominal route as the easiest method. His surgical conscience would probably not allow him to perform an ordinary operation with so little appreciation of the needs of the patient, and women in labor should not be exposed to such unscrupulous methods. There is no doubt but that many women are sacrificed every year to the lack of professional conscience which permits a surgeon to determine the fate of a patient as to whose needs he is in absolute ignorance, except that it is probably necessary to deliver her by some means, and even then an immediate delivery may not be indicated under the conditions present in the given case.

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CHAPTER VII

PREPARATIONS FOR OPERATION

Time of Operation—Necessity for Prenatal Study—Advantages of Operation at a Fixed Date—Operation Before Completion of Pregnancy—Heart Conditions—Toxemia—Hemorrhage—Precautions, if Test of Labor is Given—Preparation of Patient for Operation—Fixed Date—Emergency—Preparation of Field of Operation—The Operator and Assistants—Instruments and Sutures—Dressings—Choice of Anesthetic; General; Spinal; Local.

Time of Operation.—Unfortunately, owing to a lack of adequate obstetric training on the part of the general practitioner, who is seldom able to properly measure the pelvis, and to the fact that the great majority of pregnant women are not under careful supervision during pregnancy, a large proportion of the cases which come to cesarean section are not recognized as offering indications for the operation, until a more or less prolonged test of labor has demonstrated the need for operative interference. In many cases the failure of the ordinary obstetric operations to accomplish delivery, or the occurrence of severe hemorrhage or convulsions, affords the first evidence that the patient presents a condition which calls for radical treatment, and up to that time both patient and physician have been trusting that, since parturition should be a normal physiological process, nature may be expected to look out for the interests of the patient. That such a condition of affairs is possible is a reproach to obstetric teaching, in that it proves that the great majority of physicians have not been taught to care for obstetric cases properly, since they do not recognize the importance of prenatal examination, and attempt to conduct labor on the time honored theory that pregnancy and labor will progress normally and the attendant is not responsible for any untoward results which may occur. The traditions of obstetrics teach that every woman may be expected to deliver herself or be delivered by an operation of not undue difficulty, and that if she does not and cannot, owing to the conditions present in her case, she alone is to blame. It is only within comparatively recent years that the responsibility of the physician for the welfare of his patient has been recognized and that it is the obstetrician's duty to safeguard his patient by every means

known to modern science. If he is unable to determine himself whether his patient requires more care and skill than he is qualified to give her, he should refer her to an expert for an opinion before trouble arises and not be satisfied to call for help when in many cases it is too late.

Modern obstetric teaching must include a course in prenatal care and careful instruction in pelvimetry and in the estimation of probable disproportion between the child and the maternal pelvis, and every student who receives a medical degree in the future should be carefully instructed that no woman should be considered as normal for childbearing until a painstaking examination has proved her to be so. If intelligent prenatal examination is conducted on these lines, the great majority of obstetric abnormalities will be discovered before the patient goes into labor, and if cesarean section is necessary or advisable, that fact will be discovered before labor begins, and in doubtful cases the patient can be referred to a specialist for an opinion.

Statistics show that the results of cesarean section are best, if the operation is performed at an appointed date a few days before the estimated date of labor, or within a few hours of its onset, before the muscular efforts of labor have been sufficient to lower the vitality of the patient and before repeated vaginal examination has given rise to uterine infection. The selected date will vary somewhat with the indications for the operation, but the most nearly ideal results will be obtained, both for mother and child, if this rule is adhered to. At this time the mother will be in the best possible condition for operation, the increasing irritability of the uterus as the end of pregnancy is approached will ensure the proper contraction and retraction necessary for the control of hemorrhage at the time of operation, and the child will be fully developed and should survive, unless some congenital deformity is present. The size of the child should be carefully estimated, to avoid a possibility of prematurity, and if it seems unduly small, the date of operation should be deferred, in order not to run any risks for it.

Operation before the onset of labor gives an opportunity for careful preparation of the patient for operation, and the comfort of the patient during the early days of the convalescence will be much increased, even though the end results of the operation may be equally successful. The writers who advocate waiting for labor to begin in all cases lose sight of the fact that the obstetrician may possibly be engaged elsewhere at the time when his patient goes into labor and may not be able to come to her for several hours, which may entail much suffering on her part as well as an alteration of the prognosis of the operation for the worse, both as regards mortality and morbidity, a fact which more than counter-

balances any theoretical advantages of operating after the onset of labor.

Experience has shown that the best results are obtained by operation at the time of election, either before labor begins or very shortly after. From this time on every hour of active labor alters the prognosis somewhat for the worse, both as regards mortality and morbidity, both of which are increased if the patient is examined vaginally at frequent intervals to watch the progress of the labor, or if the membranes have been ruptured for any considerable length of time before the performance of the operation.

In late cases, i.e., those who have been in active labor for a long time, on whom many vaginal examinations have been performed, even under adequate aseptic precautions, or in whom serious attempts at pelvic delivery have been made, the prognosis both for mortality and morbidity is such that cesarean section should only be undertaken when the child is in good condition, and no other method of delivery of a living child is possible, and when the facts have been put squarely before the patient and her husband, so that they may understand the dangers of an abdominal delivery under the conditions and have an opportunity to choose whether the risks shall be taken or not, according to the value placed on the child.

Under certain circumstances an earlier date than the normal time of election may be chosen for definite reasons, owing to the desire to avoid certain dangers which may arise either for mother or child.

In certain heart conditions where the margin of safety for the patient is slight, on account of threatened decompensation or because of previous attacks of decompensation, it may seem wiser to save the diseased heart from the strain of the last two weeks of pregnancy by an early operation. If abdominal palpation shows that the child is not undersized, so that its interests will not be sacrificed by the earlier delivery, the date of operation may properly be advanced in the interests of the mother, and if the mother's condition is seriously threatening, the operation may be necessary, even though the child is apparently premature and delivery entails considerable risk for it, since otherwise both patients may be lost.

In severe toxemia, occurring in the last month of pregnancy, when for other reasons cesarean section is desirable, the date may also be advanced rather than to subject both mother and child to the dangers of an increasing toxemia which is either severely threatening or has failed to yield to treatment. In fact, the danger to the child from the maternal toxemia is so great in these cases that moderate prematurity is distinctly less dangerous to its interests than prolongation of pregnancy in the face of a toxemia which does not prove amenable to treatment. The same

rule should be applied to patients suffering from chronic nephritis who have had repeated still births, the child dying in the last weeks of pregnancy, or in cases of habitual fetal death without demonstrable cause.

In the treatment of other obstetric emergencies, such as severe hemorrhage, a similar course should be adopted when the patient is in the last month of pregnancy and cesarean section is indicated by the accompanying conditions. Cesarean section should seldom be performed in patients who are more than four weeks from the estimated date of labor, except in the presence of absolute obstruction of the pelvis or in cases in which it is decided to end the pregnancy and sterilize the patient at the same time. In these cases the baby's hold on life is precarious, owing to its prematurity, renders it undesirable to subject the mother to an abdominal operation for delivery, unless very definite advantages will result for her from such a course.

An exception to this rule may be made in cases of complete or partial placenta previa and cesarean section may be performed with propriety in any case in which the child is viable if the patient is otherwise a favorable risk. If the viability of the child is doubtful, cesarean section is not in my opinion the operation of election.

When labor has already begun before the necessity for cesarean section is recognized, or when in doubtful cases a longer or shorter test of labor is decided to be advisable, the operation should be performed as soon as the indication is recognized as positive. Vaginal examination should be avoided in these cases and rectal examination substituted, and the operation is practically never indicated after serious attempts at delivery from below have been made. It must be remembered that every hour of active labor renders the prognosis more serious, and, therefore, no delay should be permitted after the need of the operation is recognized. In these late operations the convalescence may be expected to be somewhat more uncomfortable on the average than when there has been a proper opportunity to prepare the patient for operation.

Preparation of the Patient for Operation.—When the date of operation is fixed the preparation of the patient should begin approximately a week in advance. The patient should be advised to drink as much water as she can without suffering actual discomfort. The normal six to eight glasses taken throughout pregnancy should be increased to twelve to sixteen, if possible. This will result in flushing out the system thoroughly, and in addition the tissues will be full of water, and I believe that patients so treated will suffer less from thirst after operation than if this routine is not carried out. The diet during this period should be so regulated that as little waste may be left in the intestinal tract as possible at the time of operation, and yet the nutrition main-

tained at a high level. During the last twenty-four hours before operation the diet should be light and easily digestible, foods which tend to gas formation being avoided.

The bowels should be kept freely open during this period, though active catharsis should be avoided, on the theory that it predisposes to intestinal discomfort afterwards. On the evening before operation the lower bowel should be cleansed by an ordinary soap suds enema, which should be repeated in the morning, about two hours before the time set for operation. Severe catharsis the night preceding operation is to be avoided. In the first place it accomplishes no useful purpose, if the bowels have been previously kept normally active, and by depriving the patient of sleep often brings her to operation in a more or less exhausted condition with a somewhat lowered vitality. Furthermore, some surgeons believe that catharsis just before operation increases the tendency to post-operative vomiting. If a cathartic is given the night before operation, let it be a mild one. Castor oil, which is very commonly used as a cathartic in the preparation of patients for laparotomy, is to be avoided in these cases, on account of the very definite tendency to initiate labor and thus render an operation necessary in the middle of the night, which could be performed to better advantage in the morning.

It is a good plan to give the patient a mild hypnotic the evening before operation, to ensure a good night's rest and to prevent her from lying awake worrying about the ordeal of the morrow.

Preparation of the Field of Operation.—The preparation of the field of operation varies with the personal preferences of the operator. Personally, when preparing a patient for operation at a fixed date, I prefer to begin the preparation the night before. The patient is given a full bath, preferably a shower bath, if possible. The abdomen, pubic region and vulva are then shaved and scrubbed with soap and water for five minutes. The soap is washed off with sterile water and the abdomen scrubbed with 70 per cent alcohol for three minutes. A sterile dressing is then applied and left in place until one hour before operation, when it is removed and the abdomen is painted with half strength tincture of iodine, and another dressing applied. After the patient is anesthetized for operation the dressing is finally removed and the abdomen painted once more with half strength iodine. The field of operation is now surrounded by sterile sheets and towels, leaving only the necessary space exposed, and as a final step the iodine is washed off with 70 per cent alcohol. This precaution is taken to prevent the entrance of iodine into the peritoneal cavity, on the theory that the irritation it causes

is liable to increase intestinal distention after operation and to predispose to the formation of adhesions.

One half hour before the patient is taken to the etherizing room she is given 1/120 of atropin subcutaneously, in order to make the work of the anesthetist more easy. I have discarded the preoperative use of morphia for two reasons: in the first place, unless the patient's exact dose of morphia is known, she is apt to receive a slight over dose which may affect her respiration to some extent, making it so shallow that it may prove very difficult to produce satisfactory anesthesia; and second, because the action of morphia given shortly before delivery is supposed to render the baby apneic and interfere with its resuscitation. I am free to say that my personal experience does not bear out the latter theory, but the interference with the respiration of the mother may prove a very real disadvantage.

On awaking in the morning the patient is given an ether breakfast, consisting of a cup of black coffee or bouillon to prevent faintness, but nothing is given by mouth within two hours of the time of operation. The lower bowel is again emptied by a suds enema two hours before the time set for operation. Just before being placed on the etherizing table the patient empties her bladder spontaneously or is catheterized, the latter being preferable since it ensures complete emptying of the bladder and thus avoids the embarrassment to the operation which may be caused by a partly distended bladder, if a low incision is used.

When the operation is an emergency one on a patient in labor, the preparation is much more simple, but, as far as I can see, the results are equally good. An enema is given, unless the bowels have been thoroughly evacuated at the beginning of labor. The abdomen and pubic region are given a dry shave so as not to interfere with the penetration of the iodine, which is used to prepare the field of operation. The atropin is given and the bladder emptied, as in the ordinary preparation. The patient is then anesthetized and brought to the operating room. The preparation is completed by painting the abdomen with full strength iodine, which is washed off with 70 per cent alcohol after the field of operation has been surrounded with sterile towels.

A solution of 10 per cent picric acid in alcohol may be substituted for the iodine in both methods, and is said to have the advantage of not causing irritation of the peritoneum, if it is introduced into the abdominal cavity during operation. I have as yet no personal experience with its use.

Operator and Assistants.—In addition to the operator, three assistants are needed to make the operation go smoothly, an anesthetist, an

operative assistant, and a second assistant or nurse to handle instruments and sutures. In addition, a competent person should be delegated to receive and resuscitate the baby, so that the operator's attention will not be diverted from the operation by anxiety for the baby.

The operator and all assistants who take part in the operation should wear caps, face masks and sterile gowns, so that all possible means of wound infection may be avoided, and after a thorough preparation of the hands, should don sterilized rubber gloves. The method of hand preparation varies with the preferences of the individual surgeon, but the use of rubber gloves is obligatory in modern surgery, and the hands must be carefully prepared by some method before the gloves are put on, since otherwise an accidental puncture of the gloves may result in infection.

Instruments and Sutures.—For a conservative cesarean section a very simple layout of instruments is all that is necessary, but since in any case it may prove necessary to remove the uterus for hemorrhage or other cause, the layout should include all necessary instruments for that operation. The following instruments are required: 2 scalpels, 2-4 pairs of scissors, 2 pairs of dissecting forceps, 12 short and 6 long artery forceps, 1 ligature carrier or Cleveland needle, abdominal retractors, 1 needle holder, and such needles as the operator prefers, both curved and straight with cutting and round points.

The suture material varies with the preferences of the individual surgeon. In the early days of the cesarean operation the uterus was closed by means of a fine silver wire suture, which in time was succeeded by silk and later by linen thread sutures. In later years the use of non-absorbable sutures in the uterus has largely been given up for various reasons, but particularly because, whenever infection of the uterine wound occurred, a long and painful convalescence ensued, accompanied by the discharge of suture material from the wound over a long period of time. This disadvantage is not limited to the immediate period of convalescence, since in two of my own cases the wounds which had apparently healed properly broke down after an interval of six months in one case and a year in the other, and did not heal until several sutures had been discharged. At the present time some form of absorbable material is ordinarily employed for the buried sutures, chromicized or iodized catgut or kangaroo tendon, according to the preferences of the operator. My own preference is for chromicized catgut, which can be boiled with the instruments as a final precaution, using no. 2 catgut in the uterine musculature and in the fascia of the abdominal wall, and no. 1 for the peritoneum. It must be remembered that chromicized catgut, even when

ried in a square knot as done with silk or linen thread, is liable to slip and become untied and a third knot should be tied in every important suture. Silkworm gut is the most reliable material for suturing the skin in the final closure of the abdominal wall.

The usual sterile dressings should be provided and large gauze handkerchiefs for use in the operation. No small sponges should be allowed in the operation, owing to the fact that they are easily lost in the abdominal cavity, to make trouble later. I personally prefer gauze strips, of from one to two yards in length, which can be used for either sponging or packing as desired, and are so large that there is little danger that one can be left behind at operation. That this danger is not an imaginary one every surgeon knows, although he expects to be immune himself. I have personally removed four sponges after cesarean section by other operators and know of several other instances.

In the Boston Lying-in Hospital, where the operative assistants, both interns and nurses, are constantly changing, the following routine has been adopted, which can be carried out easily in any operating room and which seems to me to leave little to chance. The gauze strips are numbered serially from one to twenty-five, which should be more than are needed in any cesarean section, twelve to fifteen being usually the maximum. In the operating room we have a wooden frame with hooks numbered to correspond with the numbered sponges. When the dry goods are opened the numbers on the tags sewed to the sponges are noted. As each sponge is discarded during the operation it is hung on the hook corresponding to its number. Before the abdomen is closed the numbers of the sponges on the frame and clean sponges on the nurse's table are checked up and the operator is responsible for any sponge not thus accounted for. At the end of the operation all sponges, used and clean, are hung on their proper hooks and the operator can see at a glance that none are missing.

In operations in private houses the nurse and assistant each count the sponges twice before and after operation, while the assistant and myself count the sponges which are placed in the abdomen for any purpose, both when they are put in and when they are removed. Before the abdomen is closed and after the operation is completed the sponges are again counted, and the count must agree with the count at the beginning of operation before the patient is put to bed.

It would seem as if there should be no necessity to insist on careful precautions in a matter of such great importance to both operator and patient, but the number of cases in which sponges are left in the abdomen at operation is so great that it is evident that many surgeons are

either careless themselves or trust to some one else who is careless, with unfortunate results for the patient and occasionally for the surgeon, since he alone must bear the responsibility for such neglect.

Choice of Anesthetic.—All of the recognized methods of anesthesia have been used for cesarean section, and each has its advantages or disadvantages in the different types of case for which cesarean section may be indicated.

GENERAL ANESTHESIA.—In patients who are normal surgical risks the use of a general anesthetic is the most satisfactory method for the operator, since it ensures perfect quiet and relaxation on the part of the patient and does away with any fear of causing undue suffering in the manipulation of the uterus.

Chloroform is commonly used in some localities, but in my opinion has no advantages over ether except in rare cases, and sometimes results fatally for the patient. The immediate dangers of chloroform anesthesia are too well known to require discussion here, but there is another source of danger in these cases, i.e., delayed chloroform poisoning. A certain number of cases have been reported after profound chloroform anesthesia, in which the patient has died a few days later with symptoms analogous to those of toxemia of pregnancy, and at autopsy changes in the liver have been demonstrated, apparently due to the effect of the chloroform. I believe it to be, therefore, an unsafe anesthetic in cesarean section for this reason, in spite of the fact that pregnant women are popularly supposed to be immune to the ordinary dangers arising from its use. The liver in pregnancy is notoriously liable to degeneration, and no drug which is known to cause liver damage under any circumstances should be employed, unless other conditions are present in the given case which may render the advantages from the use of chloroform greater than the dangers its use entails.

Nitrous oxid gas in combination with oxygen has the advantage of producing anesthesia rapidly and of being eliminated quickly. It is an easy method of anesthesia for the average patient and its use is not usually followed by vomiting, although in susceptible patients vomiting may be severe and prolonged. This method of anesthesia is not, however, suited for prolonged operations, unless the anesthetist has had special training in its use, and the evanescent anesthesia it produces may not give the relaxation necessary for a prolonged operation. If its use is preceded by morphia and scopolamin it may prove more satisfactory, but the baby is apt to be apneic following the administration of morphia shortly before delivery and to require careful resuscitation. Its employment is particularly to be advised in patients who are not considered

good subjects for ether on account of irritative conditions of the air passages, in cases in which the use of a general anesthetic is deemed advisable. Its greatest usefulness, however, is as a preliminary to the use of ether to produce full anesthesia, since it shortens the preliminary stages and does away with much of the discomfort which anesthesia produced by ether alone entails.

Gas-oxygen anesthesia should, in my opinion, never be used on patients whose blood pressure is markedly elevated. The stage of anesthesia is preceded by a short stage of asphyxia, which produces a sudden rise in pressure and throws a sudden burden on the heart, which is already working hard. Most of the fatalities reported from this method of anesthesia have occurred in cases of high blood pressure, acute cardiac dilatation developing as a result of the sudden increase of pressure. This renders it an unfit anesthetic for use in the toxemia of pregnancy or chronic nephritis. For the same reason it should not be employed as a preliminary to ether in patients who have serious cardiac lesions, especially if the myocardium is believed to be diseased. Ethylene while pleasant for the patient has, in addition to the dangers inherent to its explosive qualities, the disadvantage of increasing uterine bleeding and is not to be recommended.

Ether is the best of the general anesthetics and is practically safe for all normal patients. In irritative conditions of the lungs, in patients with cardiac decompensation, and in diabetics, its use is attended by such danger that other methods of producing anesthesia are to be preferred. On normal women, especially when preceded by gas, its use is not attended by risk or great discomfort. More or less ether passes through the placenta to the fetus and at times seems to be a factor in rendering resuscitation difficult, but this effect is transient and not productive of harm.

LOCAL ANESTHESIA.—In patients who are not good risks for a general anesthetic, i.e., patients with cardiac decompensation, diabetes, pneumonia, etc., who require cesarean section, anesthesia sufficient for operation can be produced by novocain, either injected locally into the abdominal wall, or used by the paravertebral or intraspinous methods.

After trying the various methods I am convinced that injection of $\frac{1}{2}$ per cent novocain into the abdominal walls, infiltrating all layers thoroughly and waiting a reasonable time—five to ten minutes after the injection is made—before beginning the operation, will prove more satisfactory than paravertebral or spinal anesthesia. In a somewhat extensive experience by this method I have found satisfactory relaxation of the abdominal walls. If the parietal peritoneum is well injected, the

abdominal incision can be made practically without causing pain or even marked discomfort. The uterine peritoneum is almost non-sensitive and can be incised without being infiltrated with novocain almost without sensation. The uterine musculature itself also seems to be insensitive and can be incised without being anesthetized. If a fairly low abdominal incision is made, so that the uterus can be sutured *in situ* without being dragged out of the incision, closure of the wound, including the peritoneal coat, is practically painless. The anesthesia of the abdominal wall lasts for a long enough time to render closure a simple matter without a second infiltration. If, however, there are peritoneal adhesions present from old inflammations or operations, any manipulation of them is exceedingly painful and the attempt to infiltrate them, if they are to be ligated and divided, causes marked pain, although with care it can be accomplished. Although the uterus is practically without sensation, any attempt to manipulate the broad ligaments or tubes, if it is desired to sterilize the patient, causes considerable pain, either when a ligature is passed through the broad ligament or when it is tightened around the tube, but the tubes can be excised from the uterus without causing undue suffering. Hysterectomy under local anesthesia would probably be so painful as to be practically impossible without infiltration of the broad ligaments with the novocain solution, but simple excision of the tubes from the uterine cornua can be readily accomplished.

Paravertebral anesthesia, or blocking of the posterior branches of the spinal nerves at their points of exit from the spinal foramina, is a satisfactory method of producing anesthesia from the surgeon's standpoint. It labors under the disadvantages of being a long drawn out process, requiring nearly two hours to produce satisfactory anesthesia for operation, and furthermore can only be done by an expert who has had special training in the technic. There are very few of these trained experts, especially in this country, and the length of time necessary to produce anesthesia renders it inapplicable to emergency cases.

Spinal anesthesia is a satisfactory method as far as producing good anesthesia for the operation. The use of the Pitkin or light solution, the patient being kept in the Trendelenburg position for three or four hours after operation, and excessive blood-pressure changes being guarded against by the use of ephedrin, has of late been used by us with great satisfaction. In cardiacs with orthopnea the Pitkin solution is contraindicated and the heavy solution must be used. Not only is the anesthesia gained by these methods very satisfactory from an operative standpoint, but the comfort of the patient after operation is materially improved.

The success of either local or paravertebral anesthesia will be increased, if the patient is carefully prepared for operation by the use of the morphin-scopolamin sequence. Except in emergency cases, the patient should be given hypodermically $1/6$ grain of morphia and $1/200$ grain of scopolamin from one and one-half to two hours before the time set for operation. The scopolamin, but not the morphia, should be repeated at intervals of forty-five minutes, more than two additional doses being seldom, if ever, necessary to make even the most nervous patient quiet and so drowsy that she drops off to sleep on being left to herself. As an added precaution, her ears are plugged with cotton and her eyes are bandaged just before she is brought to the operating room. When a patient is so prepared, it is often possible to anesthetize the abdominal wall without rousing her to consciousness, except very temporarily, and the operation can be performed with a minimum of suffering, if the operator is careful to wait a proper length of time for the novocain anesthesia to develop, and then is careful to be gentle in his intra-abdominal manipulations, particularly avoiding traction on the pelvic peritoneum and in handling the broad ligaments.

The recovery from the immediate effects of the operation is noticeably painless and free from shock, even in hypersensitive patients, and there is no tendency to postoperative vomiting. This method is, in my opinion, particularly suited to cardiac patients in whom more or less serious decompensation is present, although some authorities consider the use of morphin and scopolamin dangerous in such circumstances. In my experience, however, the method has been a success, and there have been no uncomfortable symptoms in the cases in which I have employed it, although occasionally, as when scopolamin is used under other conditions the patient, instead of being put to sleep, becomes more or less excited, sometimes to a degree that renders operation under local anesthesia impossible.

CHAPTER VIII

OPERATION

The Classical Cesarean Section—Use of Oxytocics—Abdominal Incision; High; Low—Technic of Operation—Question of Haste—Protection of Peritoneal Cavity—Uterine Incision—Extraction of Child and Placenta—Suture of Uterine Incision—Peritoneal Toilet—Precautions Against Postpartum Hemorrhage—Closure of Abdominal Wound—Transverse Fundal Incision of Uterus; Advantages; Disadvantages—Gastric Lavage to Diminish Postoperative Vomiting—Bibliography.

In the ordinary case the conservative, or classical, cesarean section is, from a purely technical standpoint, a simple, surgical procedure. The abdomen is opened in the mid line, or slightly to one side of it; the uterus is opened in the median line; the child and placenta are extracted; the uterus is sutured and replaced in the abdominal cavity, and the abdomen is closed. It is a simple operation in the absence of complications, usually to be completed, in the ordinary case, inside of half an hour. The steps of the operation, however, must be described more in detail, since certain points in technic may render the results more satisfactory.

It is customary to administer to the patient, shortly before the incision is made in the uterus, a hypodermic injection of some reliable preparation of ergot, or pituitary extract, or both, to aid in securing proper contraction and retraction of the uterus after the child is delivered, for the purpose of preventing or limiting hemorrhage, which may occasionally be very severe in a relaxed condition of the organ.

The time and method of administration varies with different operators and should vary with different patients. A combination of ergot and pituitary extract is more efficient than either alone, since they differ markedly in the rapidity and duration of their action. Ergot is a relatively slow acting drug, and its effect is prolonged, whereas the pituitary extract acts quickly and its action is comparatively transient, and if used alone, postpartum hemorrhage may follow when the effect of the drug wears off.

In a patient who is not in labor and in whom the contraction of the uterus is apt to be rather slow it is my custom to give one ampul of some reliable preparation of aseptic ergot deep into the muscles of the

thigh shortly after the anesthetic is started, timing it so that practically ten minutes will elapse from the time of administration to the beginning of operation, and to inject one ampul of pituitary extract into the uterine wall just before it is incised. A second ampul of ergot is given before the patient is returned to bed as a matter of precaution, to ensure contraction of the uterus until thrombosis has taken place in the uterine sinuses and the danger of postpartum hemorrhage is past. It is said that if the pituitary extract is given intravenously its action will be more rapid and therefore more satisfactory than if it is injected directly into the uterus, and from a limited experience, I believe this to be the fact.

In patients who have had previous abdominal operations and in whom there may be adhesions, the separation of which may require some time before the uterus can be opened, I prefer to give the ergot just before beginning the abdominal incision, to avoid any possibility that by an unusually prompt action it may induce spasm of the uterus prematurely, and thus interfere with the placental interchange and produce a degree of asphyxia in the child which may materially interfere with its resuscitation. This is a point of some practical importance, since it is a matter of common experience that an unusually prompt action from either ergot or pituitary extract may cause such a severe contraction of the uterine muscle as to render extraction of the child and placenta difficult, unless a much more extensive incision is made than is ordinarily necessary for delivery; and it is conceivable in such a case that, if much time were wasted in freeing adhesions, death of the child might occur from interference with the placental circulation.

If the patient is in labor at the time of operation, the uterus will probably contract and retract in a satisfactory manner without the aid of oxytocic drugs, and the administration of the ergot, being simply a precaution to prevent postpartum hemorrhage, may be delayed until the abdomen is opened, since if it should happen to act unusually promptly on an irritable uterus, it may render the extraction of the child difficult.

Some operators prefer to depend on pituitary extract alone, injecting it directly into the uterine muscle just before the uterine incision is made. Administered in this way, its action is prompt and satisfactory, but since its action is relatively transient, I feel that its use should be reinforced by the intramuscular injection of ergot, to prevent possible relaxation of the uterus with postpartum hemorrhage.

Incision of the Abdomen.—There has been much discussion in the last few years as to whether the abdominal incision should be made above or below the umbilicus, but either incision is perfectly satisfactory in the average patient. In certain types of patient, however, the location of

the incision is of importance, because of various conditions which may be present, and these conditions require some discussion. If an extra-peritoneal or low cervical operation is contemplated, so that the uterine incision will be in the lower segment, a low incision must be made, but in the average clean case the location of the incision is immaterial.

In the early days of cesarean section a long incision was employed, reaching from the ensiform to the pubes, and the uterus was delivered from the abdominal cavity before being incised, the peritoneal cavity being carefully protected by gauze packing to prevent contamination by blood and liquor when the uterus was opened. The long incision has been practically abandoned at the present time in favor of an incision just long enough to permit the easy delivery of the child, and it is customary to incise the uterus *in situ*, except in cases believed to be infected. In this case, however, a sufficiently long incision should be used to permit the delivery of the uterus before it is opened, and the peritoneal cavity should be carefully protected by gauze packing. Furthermore, in these cases the operation is best completed by amputation of the uterus, instead of returning it to the abdominal cavity to act as a source of infection and general peritonitis.

HIGH INCISION.—The advocates of the high incision urge that the incision be entirely above the umbilicus, claiming that adhesions between the uterine and abdominal incisions are thus avoided, since the empty uterus promptly retracts below the level of the umbilicus, and that hernia in a scar in this region very seldom occurs and if it does occur causes little or no inconvenience to the patient. The disadvantages of the high incision lie in the fact that, if it becomes necessary to remove the uterus for any reason which develops during operation, the incision must be widely extended; and it also seems to me that dilatation of the stomach occurs somewhat more often as a postoperative complication, if the high incision is employed. A relatively high incision, however, has a very distinct advantage in patients with fat abdominal walls, since the fat layer is much thinner above than below the umbilicus and the operation is thus made more easy; but in the average case I believe that the location of the incision is not a matter of great moment in the classical operation.

LOW INCISION.—The advocates of the low incision simply say that it has proved satisfactory in their hands, that the uterus has not become adherent to the scar in clean cases, that hernia in the scar does not occur in their experience, if the abdominal wall is properly sutured, and that from their standpoint the high incision offers no advantages.

I personally prefer, in clean cases, an incision from the umbilicus to the pubes, usually to the right of the mid line, since the uterus is twisted

to the right in about 80 per cent of all cases. This incision allows the operator free access to the uterus and any operation can be performed through it, whether the classical operation, a low cervical operation, or an hysterectomy, if the latter seems advisable. The only possible advantage of the high incision is in very stout women, in whom the upper abdominal wall is much thinner as well as less likely to be edematous than is the lower, and in women with very relaxed flabby abdomens in whom a postoperative hernia is feared.

Conduct of the Operation.—There seems to be something about cesarean section which induces a large proportion of operators to hurry, and the operation often becomes a mad scramble in the attempt to deliver the baby in the shortest possible time. I know of at least two instances in which the baby has been cut during the primary skin incision. The operator must remember that although the intestines lie behind and to the sides of the uterus in practically all cases in which there are no adhesions from previous operations or inflammatory conditions, sudden straining on the patient's part at the time of the incision of the abdomen may force a loop of intestine in front of the uterus.

In patients who have had previous abdominal operations the danger is a very real one, since it is not at all uncommon to find a loop of intestine adherent to the old incision or to the uterine scar in a position where it may very readily be injured if the abdominal wall is opened carelessly, and though I do not know of any case in which the intestine has been injured, I have seen several cases in which it might well have been, except for care exercised by the operator. There is no more reason for haste in cesarean section than in other laparotomies, and the abdominal wall should be opened deliberately by an incision approximately six inches in length. The uterus will then lie exposed directly under the incision. Since a certain degree of torsion of the uterus is usually present, the uterus should be palpated to ascertain its position as well as the position of the child, and if much lateral torsion exists, it should be brought into an approximately normal position before being opened, inasmuch as if the uterine incision is made in the region of one of the cornua, more hemorrhage is to be expected on account of the large vessels in that region than if it is opened close to the median line.

Before incising the uterus some operators prefer to protect the peritoneal cavity by gauze packs moistened with normal saline solution. In perfectly clean cases this is unnecessary, since the uterine contents are sterile, except possibly in cases of toxemia and eclampsia, in which recent observations tend to show a blood infection in a considerable number of cases. In doubtful cases the peritoneal cavity should always

be protected before the uterus is opened. Usually, however, all that is necessary for protection of the peritoneum is to compress the abdominal walls against the uterus, so that most of the liquor and blood will escape externally, the remainder being removed at the end of operation, when a careful peritoneal toilet should be performed in any case. If the patient is believed to be infected, the abdominal incision should be of sufficient length to permit the delivery of the unopened uterus, and the peritoneal cavity should be carefully protected by packing before the uterus is incised. In such a case the greater part of the incision should be below the umbilicus, to permit of easy access to the broad ligaments, etc., in case it is decided to complete the operation by hysterectomy.

Uterine Incision.—A longitudinal incision is now made through the uterine wall in the median line, a few centimeters in length, down to the membranes or placenta, if the latter is situated on the anterior wall, and rapidly enlarged with scissors to a length sufficient for the easy extraction of the child. If the incision is not long enough, it will tear at one or both ends, leaving a ragged wound, the efficient suture of which may prove a matter of considerable difficulty. In a considerable proportion of cases the placenta will be found lying under the uterine incision, but this is of no moment except that the immediate loss of blood is greater than if the placenta lies on the posterior wall of the uterus, on account of the increased vascularity of the uterine wall in the region of the placenta. If the placenta lies under the incision it should be pushed to one side or perforated and the hand passed rapidly down to the feet of the child, which have been previously located, and one or both feet grasped and the child rapidly extracted. If the placenta is not under the incision, the membranes will bulge through the wound. They should be ruptured and the child rapidly extracted. The only period of danger for the child is in the period between the beginning of the uterine incision and the extraction of the child, especially in cases in which extensive separation of the placenta from the uterine wall is necessary before the hand can be introduced into the uterine cavity; and this is the only portion of the operation in which rapid manipulation is of advantage. The entire procedure of extraction of the child should only take a few seconds, however, and there should be little or no danger to a child whose condition has not been compromised before the operation is undertaken, unless the attempt is made to extract it through too small an opening in the uterine wall. It is, therefore, important that the uterine incision should be sufficiently long to permit easy extraction and avoid any possible delay.

As soon as the child is delivered the cord should be clamped in two



FIG. 29.—CONSERVATIVE CESAREAN SECTION.

Uterine incision: fetal membranes visible.

places and cut between the clamps. The child should then be handed promptly to the assistant responsible for its resuscitation, and the operator can then devote his whole attention to the completion of the operation. The uterus should now be delivered through the abdominal wound and a

gauze pack or folded towel inserted behind it, to prevent any further peritoneal contamination. There will always be a certain amount of bleeding from the uterine incision, and sometimes large sinuses will be seen bleeding freely, but as soon as the uterus begins to contract and retract the bleeding will be largely controlled, and in my experience it is seldom or never necessary to take any active steps to control the hemorrhage. In the early days of the operation it was considered ad-



FIG. 30.—CONSERVATIVE CESAREAN SECTION.

Uterus, emptied of fetus, delivered through abdominal wall and lying upon gauze: placenta undelivered.

visable to compress the lower segment of the uterus by an elastic tourniquet, but further experience has shown this to be not only unnecessary but even positively harmful, though some operators still employ compression of the cervix made by the hands of an assistant in the broad ligament regions, with the idea that if the uterine arteries are compressed in this way, there will be little or no hemorrhage from the uterine incision during the process of suture, and that all danger from hemorrhage ceases as soon as the uterine wound is closed. This procedure has the disadvantage of being unnecessary in most cases and of

subjecting the pelvic peritoneum to an undue amount of handling, which can be avoided in all but the occasional case, and the less the peritoneum is manipulated the more comfortable the convalescence. Furthermore, when the lower segment of the uterus is tightly compressed, whether by the hands of an assistant or by a rubber tourniquet, it seems to partially paralyze the uterine muscle and temporarily diminish its contractility, thus interfering with its normal contraction and retraction, at times to a degree which definitely predisposes to postpartum hemorrhage, ultimately increasing instead of lessening the amount of blood lost. As soon as the child is delivered an ampul of some reliable pituitary preparation should be injected directly into the uterine muscle to induce prompt contraction and retraction of that organ and thus control hemorrhage. The rapidity of action of this drug is said to be much increased by intravenous injection, either a vein in the arm or in the broad ligament being selected for this purpose. As yet I have had little personal experience with this method.

As soon as the child is delivered the placenta and membranes should be removed, great care being taken to detach and remove all of the membranes, particularly those in the lower uterine segment, the retention of which may interfere with proper drainage of the lochia later by acting as a plug, which obstructs the cervical canal and thus predisposes to retention of lochia, at times to a degree which may give rise to uncomfortable symptoms and necessitate active treatment.

Suture of the Uterine Incision.—The uterine wound should now be sutured according to the technic of the individual operator, the points to be observed being complete closure of the wound in the uterine musculature and careful suture of the peritoneum over it. My own method of suturing is first a continuous suture of No. 2 chromic catgut which includes the deeper two-thirds of the musculature. A second layer of interrupted sutures is then placed, including the upper half of the musculature to but not including the peritoneum. The final suture is a continuous catgut suture including the upper musculature and the peritoneum. Care should be taken not to tie the sutures sufficiently tight to cause necrosis of the uterine wall, and yet tightly enough to control all bleeding. I believe it to be important that the stitches placed at the upper and lower angles of the wound should be so placed as to include any sinuses which may enter the angles of the wound, since if this precaution is neglected, troublesome bleeding may occur. Any packing which has been inserted into the abdominal cavity is now removed and the peritoneal cavity carefully cleansed of any liquor or blood which may have escaped into it, and the abdominal wall closed in layers.

Transverse Incision of the Fundus.—In 1897 Fritsch suggested that a transverse fundal incision be substituted for the ordinary longitudinal median incision of the uterus, on the theory that, since the course of the blood vessels in that region is largely transverse, large vessels are less likely to be injured and hemorrhage will be minimized. Many operators have followed his lead, but the results, though excellent, have

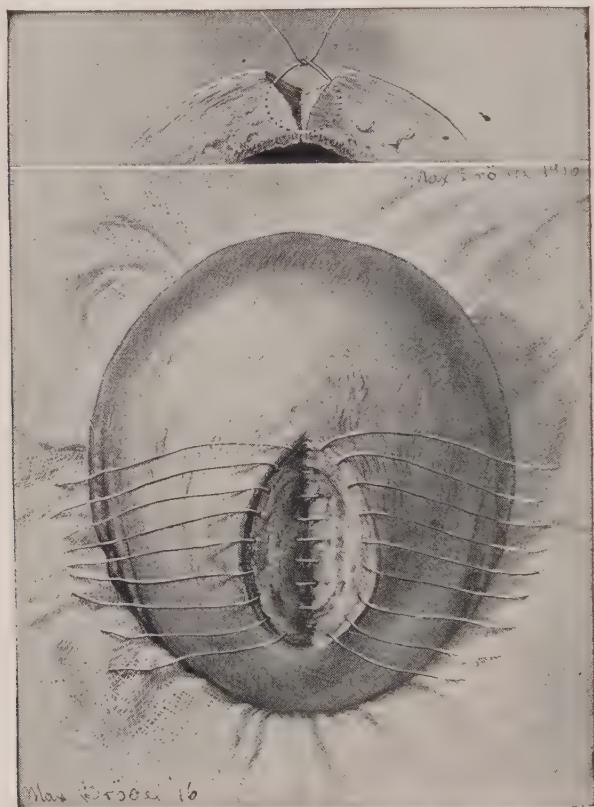


FIG. 31.—CONSERVATIVE CESAREAN SECTION.
Placenta delivered and deep sutures inserted.

not proved to be any better than those obtained by the ordinary incision, and to-day it is practically abandoned.

It has been urged that, if the incision is made in this region, the adhesions between the uterine and abdominal incisions are eliminated. This is undoubtedly true, but the fact that the liability to adhesion between intestine or omentum and the uterine incision is much increased renders this advantage of distinctly minor importance. Furthermore,

it is evident that, in case of infection of the uterine incision, the peritoneal cavity is to a certain extent protected by the fact that the uterine incision may become adherent to the abdominal wall, and if an abscess forms it can be drained with ease through the abdominal incision, or an extension of it, whereas, if the fundal incision were employed, the septic material would escape directly into the general peritoneal cavity, causing peritonitis and death.

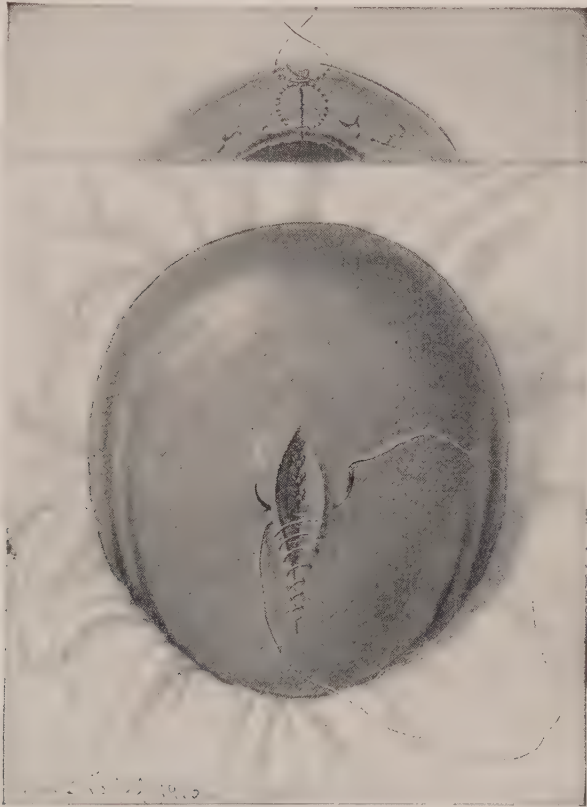


FIG. 32.—CONSERVATIVE CESAREAN SECTION.

Deep sutures buried: external muscle and peritoneum joined by continuous suture.

The only real advantage of this incision would seem to be in cases in which it is proposed to sterilize the patient by excision of the tubes from the uterine cornua, which can be accomplished by a single incision in this location. Within the last few years an incision in the lower uterine segment, entirely below the contractile thick uterine fundus, has been gaining in popularity, even in clean cases. In this operation the bladder is separated freely from the anterior surface of the uterus, so that the

whole lower uterine segment and the upper portion of the cervix is exposed. An upper flap of peritoneum may also be dissected if the operator wishes. The uterus is then opened, either by a median longitudinal incision (Beck) or by a transverse incision (Kerr) and the baby extracted by forceps. After the removal of the placenta the uterine incision is closed in two layers, three being unnecessary as the uterine wall is very thin, and the peritoneum is sutured over it in such a way that the incisions in the uterine wall and peritoneum do not coincide. The double peritoneal flap undoubtedly covers the uterine wound more efficiently, but this precaution is seldom or never necessary. The advantages claimed are that, the uterine incision being walled off from the peritoneal cavity, convalescence is smoother and more comfortable for the patient in clean cases, while if infection of the uterine wound occurs, it will remain extraperitoneal and, therefore, be less serious than if the wound connects directly with the peritoneal cavity. It is also claimed that the wound, being in the passive portion of the uterus, is less affected by the alternating periods of contraction and relaxation which occur in the active portion of the uterus and, therefore, will heal more satisfactorily and ultimately give a firmer scar, which will be less liable to rupture in future pregnancies.

The advantages to be gained in clean cases at the time of election from this modification are somewhat theoretical but a fair experience with the operation has convinced me that the convalescence is more comfortable even in clean cases if the lower uterine incision is employed, and probably increases the safety of the operation in doubtful cases. Neither method is, in my opinion, a proper one in definitely infected cases unless hysterectomy is performed. Troublesome bleeding sometimes occurs from injury to veins in this region and its control may prove a matter of considerable difficulty. This is especially true in case the longitudinal incision is employed and furthermore the technic of this operation is distinctly more difficult. I much prefer the Kerr method although I must admit that my experience with it is not as yet sufficient for me to speak with any authority on the behavior of the uterine scar in subsequent pregnancies.

There is no question but that, if infection of the uterine wound occurs, a localized process between the uterus and bladder will be less immediately dangerous to the patient than if the infected uterine wound communicates directly with the general peritoneal cavity, but this alternative does not often arise in cases operated on at the time of election, and, in my opinion, this operation is especially for patients in whom the classical cesarean section seems to offer undue risks, and yet for whom

cesarean section by some method seems to be definitely indicated. This group includes patients who have been subjected to a prolonged labor and those who have been repeatedly examined vaginally, even under good asepsis. It does not include, however, those who are frankly infected, for whom cesarean section should be avoided if possible, and when it seems unavoidable should be followed by hysterectomy.

It has been advised by some operators that the cervix should be dilated from above to ensure free drainage for the lochia before the uterine wound is closed, but this is unnecessary in most cases, and unless the vagina has been surgically prepared, is a possible source of danger to the patient. Furthermore efficient cervical dilatation will often prove difficult and may be attended by so much trauma as to offer a portal for infection and thus increase the danger to the patient. Vaginal preparation should always be carried out in cases that have been long in labor or that have had vaginal interference before the abdominal operation is undertaken, but is not otherwise necessary, and in these cases I believe that it is a wise precaution to irrigate the lower portion of the uterine cavity with 70 per cent alcohol, which is allowed to drain away through the cervix.

The vaginal preparation should consist either of painting the vagina and cervix with half strength tincture of iodine or the instillation of one ounce of 2 per cent mercurochrome into the vagina, according to the preference of the attendant.

Before the abdominal wall is closed the lower uterine segment should be palpated, and if it is found filled with clots, as is often the case, they should be milked out through the cervix. The uterus should be watched carefully and kneaded from time to time, to ensure efficient contraction as a guarantee against hemorrhage, and the abdomen should not be closed until satisfactory contraction has been obtained, which may in some cases require some little delay. Most of the cases of serious post-partum bleeding have occurred in cases in which the condition of the uterus was not carefully ascertained before the abdomen was closed, and the uterus should always be palpated to learn its condition just before the peritoneal closure is completed. The abdominal wall is closed in layers, the skin being carefully approximated. The method of closure depends on the preferences of the individual operator, any carefully done layer suture being efficient.

While the final layer of sutures is being placed in the abdominal wall I always adopt the precaution of washing out the patient's stomach in the hope of removing any ether which may have been secreted into the stomach during operation, which may act as an irritant and increase the

tendency to postoperative vomiting. The results of this treatment seem to warrant its continuance, as few of my patients are troubled with vomiting during the twenty-four hours immediately after operation, and the avoidance of retching makes them much more comfortable. There is a small proportion, however, in whom nothing seems to affect the postoperative vomiting. Many of these patients vomit excessively after gas-oxygen anesthesia, so that it is apparently some condition of the gastro-intestinal tract, rather than the anesthetic, which is responsible.

After the abdominal wound is closed the dressing is applied and the patient put to bed, usually being given one sixth, or a quarter of a grain of morphia as soon as she becomes restless and begins to show signs of recovery from anesthesia. Unless the patient gives a history of uncomfortable reaction to morphia in the past, the dosage is repeated as often as may be necessary for the next twenty-four hours, bearing the fact in mind that if severe postoperative vomiting develops morphia may be a causative factor in susceptible individuals. In this case pantopon in one-third of a grain doses is substituted for the morphia. Pantopon is less satisfactory in relieving pain than is morphia, but the fact that it so seldom or never causes vomiting or restlessness makes it a very useful substitute.

The technic of supravaginal hysterectomy and extraperitoneal cesarean section will be considered in separate chapters.

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CHAPTER IX

AFTER CARE

Relief of Pain—Thirst—Diet—Care of Bladder—Bowels—Intestinal Distention—Lochia—Treatment of Returned Lochia—Antiseptic Precautions—Vaginal Douches—Contra-indicated—Lactation and Nursing—Temperature—Pulse—Bibliography.

The after care of the patient who has had a cesarean operation is a combination of the care of an ordinary laparotomy, plus the usual precautions carried out after a normal delivery. There are certain complications which are apt to arise and which must be guarded against or watched for, since they may cause considerable anxiety and, if neglected, may prove serious. This is particularly true in patients who have been in labor for any length of time and have been subjected to frequent examination, but the simplest case may give rise to symptoms which will cause serious anxiety. As a general rule the recovery from the anesthetic is prompt and attended by little or no vomiting, if the stomach has been washed out before the patient leaves the table; in fact, as in other obstetric operations, there would seem to be less nausea and vomiting than in other cases where ether is given to full anesthesia.

Pain.—Many patients suffer severely from pain during the first few hours after operation, and repeated doses of morphia may be required to keep the patient quiet and fairly comfortable, and may be used without hesitation.

Two factors seem to enter into the causation of pain, the wound itself and the so-called after pains, due to repeated contraction and relaxation of the uterus. The pain from the wound is ordinarily easily controlled, but in the occasional patient, usually a multipara, the after pains cause marked discomfort, and the patient complains bitterly. In one of my patients recurrent uterine contractions at short intervals caused so much suffering as to render necessary the administration of one and one fourth grains of morphia in divided doses before any appreciable relief was obtained. In these cases repeated doses of morphia at short intervals may be required to make the patient comfortable, and should be given, if necessary, during the first twenty-four hours. After this time morphia is seldom necessary, and any discomfort which remains can usually be controlled by codeia, which is less likely to cause intestinal stasis, and

is to be preferred. In the comparatively rare case in which severe and prolonged postoperative vomiting occurs the possibility that the morphia used to control pain and discomfort may be a causative factor should be considered, and if codeia combined with the use of aspirin by rectum proves inadequate, opium suppositories may prove effective, both in relieving the pain and controlling the vomiting, although pantopon in doses of one-third of a grain subcutaneously is the best substitute for morphia. This drug, while less efficient in controlling pain than is morphia, does not cause vomiting and is often more efficient in quieting restless patients.

Thirst.—Most patients complain of thirst after any abdominal operation. This can be relieved to some extent by the rectal administration of eight ounces of tap water every three or four hours, to which may be added one drachm of bicarbonate of soda as a prophylaxis against any tendency to acidosis, which may prove a factor in causing postoperative vomiting. Since, however, there is usually little vomiting, if the stomach has been cleansed of any ether it may contain by lavage, the patients may be given water by mouth in moderate amounts as soon as they recover from the effects of the anesthetic. If vomiting occurs, water should be temporarily withheld. It is unwise to give large amounts at any one time in the first forty-eight hours, owing to the fact that large amounts of liquids by mouth apparently favor acute dilatation of the stomach, which seems to be a relatively common complication after cesarean section, especially in patients who suffer severely from hyperacidity and other digestive disturbances during pregnancy, or who, when not pregnant, show ptosis of the abdominal viscera.

Diet.—It is usually customary after an abdominal operation to begin feeding the patient small amounts of liquid nourishment as soon as the tendency to nausea has disappeared, gradually increasing the amount and not giving solid food until usually forty-eight hours or more have elapsed. My experience with cesarean section has convinced me that a copious supply of liquids by mouth shortly after operation tends to increase the tendency to gastric dilatation, and it is now my custom to begin with small amounts of orange juice and albumen, or milk and lime water, in not more than one ounce doses at hourly intervals to test the tolerance of the stomach. If after two or three doses the stomach seems to be tolerant I then shift at once to a semisolid diet, milk toast, junket, cereals, etc., given in small amounts at relatively frequent intervals, and believe that if the patient is treated in this way the danger of acute dilatation of the stomach is much diminished, though not entirely abolished, since in some patients general ptosis of the abdominal organs

is present and the sudden relief of pressure, incident to the emptying of the uterus, allows the stomach to prolapse, and a kink being formed in the duodenum, dilatation of the stomach results. If after the second day the stomach is functioning satisfactorily, the patient is put on a full diet, on the theory that if a full diet is given as early as possible, not only will the patient recover her normal strength more quickly, but that lactation will be established earlier and more satisfactorily.

Bladder.—Some authorities recommend that the cesarean patient should be catheterized about twelve hours after operation and from then on at regular intervals for the next forty-eight hours. I consider this usually unnecessary. There is no reason for catheterization in the average case for practically twenty-four hours unless the patient complains of discomfort. The average secretion of urine is not over twenty ounces during this period, and the great majority of cases will be able to urinate spontaneously before the bladder becomes overdistended or marked discomfort develops. If discomfort develops, the patient should be promptly relieved, and if repeated catheterization is found necessary, urotropin gr. v-x should be given every four hours as soon as the stomach is tolerant. It is also a wise precaution, when catheterization is necessary for a considerable period of time, to irrigate the bladder with 2 per cent boric acid solution at the time of catheterization once or twice a day. If the patient is treated in this way, cystitis will prove a rare complication, even though the use of the catheter proves necessary throughout the entire period of convalescence. If the patient is absolutely unable to void, routine catheterization every eight hours should be instituted, and if in spite of the precautions above noted, signs of bladder irritability develop, the instillation of one ounce of 25 per cent argyrol into the bladder will usually relieve the condition. If after a few days of catheterization the patient apparently regains control of the bladder, the routine use of the catheter should be omitted; but since in some cases the emptying of the bladder is only partial, sometimes only the overflow from a distended bladder being evacuated, it is well to catheterize once daily for a day or two, because if a considerable residual quantity of urine remains, infection is very apt to occur and a troublesome cystitis or pyelitis develop.

Bowels.—The bowels should be opened rather more promptly after cesarean section than after an ordinary laparotomy. This is advisable for two reasons: in the first place there is usually an accumulation of fecal matter in the intestines during the latter part of pregnancy, even though apparently satisfactory daily evacuations have taken place, and the patient will be rendered much more comfortable if the intestinal

tract is emptied early in the convalescence. In the second place the sudden alteration in intra-abdominal pressure in women who have been delivered by cesarean section, plus the tendency to intestinal stasis and gas formation in any patient who has had an abdominal operation, predisposes markedly to the accumulation of gas in the intestinal tract. In many cases the distention is extreme and the patients suffer marked discomfort, the abdomen being so distended as to be as large as before operation. In some cases, of course, this distention is a sign of peritoneal infection more or less severe. A very satisfactory method of opening the bowels is to give the patient one-half ounce of milk of magnesia by mouth every four hours beginning as soon as any tendency to nausea has disappeared. This has a double advantage in being a mild laxative and in counteracting the hyperacidity of which many patients complain for the first few days after operation. The use of eserin in doses of 1/150 grain every four to six hours, initiated about twenty-four hours after operation, is often very useful in promoting peristalsis and overcoming any tendency to intestinal stasis. In addition, the rectal tube is inserted at frequent intervals, and unless it causes severe discomfort it is left *in situ* for considerable periods of time, though not constantly, as some operators advise. If signs of distention occur early, or if the patient begins to pass gas through the tube, an ampul of pituitary extract is given hypodermically. This is followed in from one-half to one hour by an enema consisting of two ounces of glycerin and two of water. This is retained in the rectum for about two hours, unless it acts promptly, when it is followed by an enema composed of either milk and molasses in equal parts of eight ounces each, or of epsom salts two ounces, glycerin two ounces, and water eight ounces, with two drachms of spirits of turpentine.

Not infrequently the first enema will give marked relief, much gas and more or less fecal matter being passed, but it is often necessary to give repeated enemata, in which case it is well to alternate between the two. If the patient is not in good condition and the use of an enema causes marked exhaustion, as is sometimes the case, the milk of magnesia, pituitary extract and the rectal tube will often prove sufficient.

If there is no tendency to distention and if the patient is not uncomfortable, it is well to leave the bowels alone for forty-eight hours, when the use of enemata, with or without pituitary extract, will prove promptly successful in most cases. It is my feeling that after ordinary operations most surgeons attempt to open the bowels unnecessarily early, rather for the purpose of relieving their own minds than for the welfare of the patient, and the patient is often left nervously and physically exhausted

as the result of too active attempts to empty the lower bowel, when there is little or nothing there to be removed by enemata. After cesarean section, however, the tendency to abdominal distention from purely mechanical causes is so great that it is distinctly advisable to open the bowels early to prevent the discomfort incident to marked intestinal distention.

Lochia.—If the uterus and lower segment have been emptied of clots at the time of operation, the flowing will be no more profuse, and in many cases distinctly less profuse, than after a normal labor. If, however, the lower uterine segment has been left filled with clots at the end of operation, these clots must come away, and until the accumulation is evacuated the flowing will be more profuse than normal, and clots of considerable size may be passed.

It not infrequently happens, however, that retention of lochia occurs to a considerable degree just as after normal labor, becoming evident usually about the third or fourth day. This is theoretically more likely to happen when the operation has been performed on patients at the time of election, before any dilatation of the cervix has taken place, but in my experience cervical dilatation seems to make little difference, and I have seen a number of cases of retention of lochia in patients who were well advanced in labor at the time of operation. Placing the patient in Fowler's position to favor drainage, an ice bag over the uterus to stimulate contraction, and the administration of small doses of fluid extract of ergot by mouth (unless it causes nausea) will usually prove promptly successful in relieving the retention. If these measures do not succeed promptly, and especially if the patient begins to have an elevation of temperature and show other signs of absorption from the uterus, more active measures should be resorted to.

In some instances the retention is due to the non-dilatation of the cervix, or to its recontraction, if it was dilated at the time of operation, but in others it seems to be due to the exaggerated angle between the cervix and body of the uterus, which is commonly seen in normal labor. To secure proper drainage in these cases the cervix should be freely dilated with a steel dilator. Even in patients who were not in labor when cesarean section is performed the cervix will be found so much softened and relaxed by the end of forty-eight hours that little force is necessary to dilate it, and the procedure usually causes so little pain that the use of an anesthetic is seldom called for, although any manipulation of the uterus produces more or less discomfort.

Strict surgical asepsis must be carried out. The patient is placed in the cross bed position, or on a table, if a good light cannot be obtained

in bed. The vagina is thoroughly cleansed. The cervix is exposed by a speculum, grasped with bullet forceps and drawn down as close to the vulval outlet as is possible without causing too much pain, and then carefully cleansed with alcohol. It is now freely dilated with a branched dilator up to the point at which it will admit one or two fingers freely. A small amount of lochia and perhaps a few clots will escape from the uterus, but usually a very small amount when it is compared with the degree of comfort the patient experiences from the relief of the retention. The important factor seems to be the establishment of free drainage, rather than the amount of retained lochia removed. Curettage under these conditions is distinctly not to be advised, the removal of the obstruction to drainage being all that is necessary.

Antiseptic Precautions.—The same antiseptic precautions should be adhered to after cesarean section as after normal delivery. If the vulva is not kept cleansed from lochia, decomposition will occur and the unpleasant odor will keep the patient uncomfortable. I do not believe that an ascending infection will result from this lack of cleanliness, but a nurse who does not keep her patient clean is not to be trusted in other respects. The vulva should be kept covered with a sterile pad, which should be changed as a routine every three or four hours, or whenever soaked with lochia. It should also be changed after urination or defecation. Whenever the pad is changed the vulva should be douched off with a non-irritating sterile solution. Boric acid or sterile water is satisfactory for the purpose. Corrosive sublimate should not be used, even in a weak solution, since it can accomplish no useful purpose as an antiseptic and not infrequently a dermatitis results from its use, which adds greatly to the patient's discomfort.

The use of vaginal douches during the early part of the puerperium should not be permitted under any circumstances. In the first place they accomplish nothing, and in the second they may be productive of harm, if improperly given. After the end of a week a sterile vaginal douche may be given daily, if the lochia have an offensive odor, and later in the puerperium douches may be used, if the uterus is not involuting properly, but in the routine care of the convalescence they have no place.

Lactation and Nursing.—It has seemed to me that patients who have been delivered by cesarean section are on the whole less likely to be able to nurse than women delivered normally, and that even if they eventually do make satisfactory wet nurses, the establishment of lactation is delayed for from one to three days longer than in the average normal patient. This may be accounted for in elderly primiparae on the theory of the atrophy of disuse, the breasts having gone so long without being

called on to function that degenerative changes have taken place in the glands.

In women with undeveloped pelves, i.e., justominor pelves, the pelvic organs are apt to be underdeveloped as well as the pelvis. It is very probable that the mammary glands are somewhat undeveloped also and are, therefore, in such women less likely to function properly, a fact which probably often accounts for the patient's inability to nurse her child. In other cases, as for instance in subnormal women who are delivered by cesarean section in preference to a pelvic delivery, the reason for unsatisfactory lactation is evident, since these women are seldom good wet nurses after a normal delivery. In many cases, however, no explanation for the unsatisfactory breast function is evident, although the delay may be due, at least in part, to the period of starvation which follows operation.

Since these classes of patients make up a very considerable proportion of the patients for whom I consider cesarean section advisable in private practice, the explanation of what is definitely true in my experience, that cesarean patients are less likely to prove satisfactory wet nurses than women delivered normally, may be merely the type of women on whom the operation is performed, rather than the method of delivery.

Temperature.—Patients who have undergone cesarean section seem to be more prone to have an elevation of temperature than patients who have had other abdominal operations. Aside from the patients in whom definite infection is diagnosed or suspected, or in whom retention of lochia occurs, various minor conditions cause an undue reaction, a fact which is to a certain degree noticeable in women after normal labor. This is probably to be explained by the fact that absorption from the extensive wound surface, plus the waste products produced by the involution of the uterus, tax the excretory organs to the limit and render the patient unduly susceptible to minor stimuli. Furthermore, in the closing of the uterine wound a large amount of suture material is buried, and it is also probable that a certain amount of pressure necrosis develops around the sutures, particularly if they are tied too tightly in the attempt to control all hemorrhage, both of which factors increase the absorption and render the patient more susceptible to minor disturbances of function which under normal conditions would not give a noticeable reaction.

Immediately following operation there is apt to be a moderate rise of temperature, as a rule not over 100.5 degrees, but occasionally reaching 101 or 102 degrees. In clean cases the temperature reaches normal

in from twenty-four to forty-eight hours and should remain at approximately the normal level throughout the remainder of the convalescence, but any complication which arises will be attended by a rise in temperature. This initial temperature may be due to a slight peritoneal reaction caused by the spilling of more or less liquor amnii into the abdominal cavity when the uterus is opened. It is unimportant in itself, but shows what may be expected, if in infected cases any of the infected liquor escapes into the peritoneal cavity.

Any cause which would lead to a rise in temperature after a normal delivery will cause a similar reaction after cesarean section, but in most cases the uterus will be the offending organ.

Pulse.—The pulse after cesarean section shows nothing remarkable. It is apt to be very rapid during operation, and at the time when the uterus is opened the pulse may temporarily disappear. This should cause no anxiety, however, as it seems to be entirely without significance. During closure of the uterus the pulse usually improves in quality and becomes slower, to again become more rapid when the patient begins to come out of ether. The pulse rate then drops to or even below normal in patients who have not suffered severely from hemorrhage or exhaustion, just as in the normal obstetric case. A rising pulse within a few hours after delivery may be a suggestion of internal concealed hemorrhage and should call for investigation.

A sharp rise in the pulse rate may occur in the second twenty-four hours, the rate sometimes reaching 130-140. This is often an accompaniment of acute dilatation of the stomach, and indeed a rapidly rising pulse may be the first noticeable symptom of this complication and should be taken as a danger signal. With marked intestinal distention the pulse will usually be rapid, but in these cases the change will be gradual and not as sudden as in dilatation of the stomach. In other complications the pulse rate follows the temperature fluctuations more or less closely, except that in cases of general peritonitis a rising pulse will often be associated with a dropping temperature in the terminal stages.

As a general rule a dropping pulse is a favorable sign in cases of infection, even though the temperature remains high, and a favorable prognosis can be given in such cases, since the temperature will follow the pulse within a day or two, the improvement in the pulse rate being an index of the increased resistance of the patient.

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CHAPTER X

COMPLICATIONS OF THE CONVALESCENCE

Acute Dilatation of Stomach—Pneumonia—Embolism—Septic Complications—Infection of Uterine Wound—Cystitis—Thrombophlebitis—Peritonitis—Appendicitis—Bibliography.

The convalescence from cesarean section may be expected to be a fairly smooth one in the majority of patients in whom the operation is elective, but any of the complications which occur after normal delivery or after laparotomy may arise, and certain ones, e.g., retention of lochia and acute dilatation of the stomach, are relatively common. The convalescence following operation on doubtful risks is apt to be a very stormy one, however, and many patients only recover after a prolonged and desperate illness, while the mortality in these patients is relatively high.

Acute Dilatation of the Stomach.—Perhaps the most common, as well as the earliest complication to be looked for, following cesarean section, is acute dilatation of the stomach. It occurs much more frequently apparently after this operation than after any other laparotomy, and is more liable to affect certain types of patients than others, being met with much more often in private than in hospital practice.

Patients suffering from ptosis of the abdominal viscera before the beginning of pregnancy seem to be more apt to develop this complication than other types of patients. This is probably due to the fact that the stomach, which has been held up in good position by the enlarged uterus, prolapses as soon as the support is removed. In its new position a kink is formed at or near the pylorus and drainage is interfered with to such an extent that it becomes acutely distended. That acute dilatation is not more common after normal delivery suggests that some other factor than ptosis must be present, and this factor is probably supplied by the increased gas formation and diminished peristalsis, which so often follow abdominal operations, a more or less sharp angle at the pyloric end of the stomach being closed by the pressure of the distended intestine below. The condition seems also to be favored by the ingestion of large amounts of fluid in the first thirty-six hours after operation, and apparently occurs less often if the patients are given water rather sparingly and are on a semisolid diet from the beginning.

Another class of patients who seem particularly liable to this complication are the neurotic women who suffer markedly from hyperacidity and other digestive disorders during pregnancy. There may be a tendency to ptosis in these women also, but in many cases at least it is not demonstrable until after delivery, and has not been discovered in the non-pregnant condition.

The relative frequency of gastric dilatation in private, as compared with hospital practice, would seem to be due to the fact that in private practice the operation is often performed because the patient seems a poor general risk for the strain of labor, rather than for pelvic insufficiency, a fact which only enters into hospital practice to a limited degree. There seems to be no doubt but that the high incision predisposes to this complication to some extent, but the general condition of the patient seems to be even more of a factor in its production.

In typical cases the patient seems in good condition shortly after operation. The temperature may be slightly elevated, 99° - 100° or practically normal at the end of twenty-four hours, and the pulse is normal. There is no nausea and the patient seems to be doing well. Some time during the next twelve to twenty-four hours the patient's condition changes markedly for the worse. Nausea develops, attended by hiccough in many cases, and the patient may begin to spit up small quantities of a dark greenish fluid with an unpleasant odor, or she may vomit a large amount of the same material with a good deal of gas. After a few hours she begins to look badly and the face becomes grayish and drawn. The temperature rises in some cases to 101° or 102° , and the pulse becomes progressively more rapid, at times reaching 140 or more within a few hours, and the quality changes for the worse. The picture often looks like that seen in a beginning peritonitis. The abdomen is distended, particularly in the upper portion, but the distention is soft and the abdomen is usually not unduly tender. At times the patient appears seriously sick, and she is always restless and uncomfortable. This sudden change from being in satisfactory condition to being apparently a very sick woman suggests one of two things, either peritoneal infection, due to a very virulent organism, in which case the prognosis is hopeless, or acute dilatation of the stomach. In most cases it is the latter and the means of diagnosis and treatment are the same, i.e., gastric lavage. The passage of the stomach tube is often followed by the explosive escape of gas through the tube, followed by a large amount, often a pint or more, of the same sort of material that the patient has been regurgitating. The stomach should be washed out with warm water containing bicarbonate of soda and then drained and left empty. The

patient should then be given an injection of 1/6 gr. of morphia to quiet her and give her a chance to sleep. She should be made to lie on the right side as much of the time as possible to favor drainage of the stomach.

Everything should be withheld by mouth for several hours. If the patient is uncomfortable from thirst, or if the tissues seem dried out, the mouth should be swabbed out with water, and fluid should be given under the skin or by rectum. After five or six hours food may be given, preferably of the semisolid variety, in small amounts. The improvement in the patient's condition under this form of treatment is very rapid, the pulse and temperature dropping quickly to normal, unless the condition has persisted some time before being treated. Occasionally the condition may recur and a second lavage be necessary, but this is the exception, and one treatment is usually sufficient, the only after effect being an apparent delay in the establishment of lactation, which seems particularly late in these cases, and is probably due to the rather prolonged period of starvation to which the patient is subjected. Whether an uncomplicated acute gastric dilatation would ever prove fatal is a question. The majority of fatal cases who have come to autopsy have shown either a beginning peritonitis or intestinal obstruction, but the symptoms are often sufficiently alarming to suggest the possibility of a fatal issue unless relief is given, and the results of lavage are prompt and satisfactory.

Pneumonia.—So-called ether pneumonia occasionally occurs after cesarean section, but with no greater frequency than after other surgical operations, except perhaps in cases who have been operated on as emergency cases after having been in labor for some time and who have had no proper preparation. It is not uncommon, in my experience, to find that labor not infrequently interferes with digestion and that the stomach after labor often contains undigested food, though no solid food has been taken for ten or twelve hours, or even longer. Inhalation pneumonia is not an uncommon sequel to vomiting under the anesthetic in patients of this type.

The treatment is symptomatic and the course is usually short and favorable. A certain number of the patients die, however, and pneumonia must be considered as one of the dangers attendant on surgery under general anesthesia, especially on patients who have not been properly prepared for operation. Within the last few years it has been suggested that the so-called ether pneumonia is not dependent on the anesthetic, but occurs with practically equal frequency after abdominal operations, performed under local or spinal anesthesia, and at least one

series of cases has been reported to support this claim. In these cases the pneumonia must be embolic in character and not due to irritation from the anesthetic. This has, however, not been my own experience.

Embolism.—In comparatively rare instances, very rare if we except the cases secondary to pelvic thrombophlebitis, pulmonary embolism occurs with serious or fatal results. There are no means of predicting when it will occur and no means of preventing its occurrence. It is simply one of the surgical accidents which may follow any case of labor or abdominal operation, but particularly operations on the uterus, and its possibility must be considered in stating the prognosis of the operation to the patient. It is probably slightly more common after cesarean section than after normal labor, but this is probably due to the fact that phlebitis is rather more common in these cases, owing to the fact that many operations are performed on patients who are already infected with organisms of low virulence by vaginal interference at the time operation is undertaken. Embolism may occur at any time after operation, just as after normal labor, growing progressively less frequent the longer the interval since operation in normal cases. In septic cases with thrombophlebitis embolism usually occurs late in the convalescence, i.e., between the second and fourth weeks as a rule, and the patient cannot be considered out of danger until sufficient time has elapsed for complete organization of the thrombus to take place.

Septic Complications.—One of the most common septic complications following cesarean section is a thrombophlebitis of the pelvic veins, which may involve the veins of one or both legs by extension and give rise to phlegmasia alba dolens. The general consensus of opinion is that phlebitis is secondary to a septic process at the site of operation.

As is to be expected, therefore, phlebitis is most common in the patients on whom cesarean section is performed under relatively unfavorable conditions, i.e., after prolonged labor or after repeated vaginal examinations or attempts at delivery. The uterine wound in these cases is prone to become infected and a septic thrombosis of the pelvic veins results. In other cases, when the uterine sutures have been tied too tightly, a certain amount of pressure necrosis results. If no infective agent is present the necrotic tissue will be taken care of without symptoms, but in a large proportion of cases a culture from the fundus of the uterus will show pyogenic organisms by the end of the week or ten days after delivery, even though no vaginal interference has been practiced. This has been repeatedly demonstrated in cases delivered normally. If the sutures used in closing the uterine incision enter the uterine cavity these

necrotic areas may become sufficiently infected to form a septic focus from which phlebitis may result.

In still other cases a septic cystitis, due to unclean catheterization, may be the focus of infection which results in phlebitis. In other words any septic focus in or near the uterus may act as the exciting cause. I am extremely skeptical in regard to the occurrence of phlebitis in the absence of sepsis, except in the very rare cases which occur so soon after delivery that only a preëxisting sepsis might have caused them, and even in these cases a septic focus elsewhere in the body cannot be eliminated as a possible cause.

As a rule, in the patients who develop phlebitis, the convalescence has not been normal. The pulse and temperature have usually been suggestive of the fact that some septic absorption was going on, although the symptoms may not have been severe enough for definite localization. Usually the definite symptoms appear at or near the end of the second week, pain and tenderness in the groin with swelling of the leg and a rise of pulse and temperature.

The treatment of these cases consist of absolute rest and the relief of pain. The affected leg should be placed at once in a pillow splint, partly for comfort, but more to prevent the patient from moving it thoughtlessly, and thus favoring the detachment of a portion of the occluding thrombus and embolism. An ice bag applied over the groin, lead and opium liniment along the course of the affected veins, and the use of aspirin will usually control the pain, though in some cases opiates may be necessary for a few days. Fresh air, sunlight and good food, to raise the patient's general condition, should form a part of the treatment.

It is always a question whether anything can be done to limit the extension of or to favor the resolution of the thrombi in the affected veins. For several years I have employed lemon juice, or citric acid in capsules, in the treatment of all cases of phlebitis, or as a prophylactic measure in cases whose convalescence was not perfectly normal, on the theory that although the pelvic phlebitis might occur when a septic process was present in the uterus, the extension of the process into the veins of the legs might be prevented or limited by lowering the clotting power of the blood by neutralization of its calcium content.

The approximate dosage is forty-five grains of citric acid per day for an average sized person, or a corresponding amount of lemon juice. Although it is impossible to state definitely whether any good is accomplished by this method of treatment or not, I am convinced in my own mind that such cases of phlebitis as I see are milder in course and

leave less permanent disability than before I began the use of citric acid. It may be, of course, that the cases have all been mild, and that the veins of the legs would not have been seriously involved in the process in any case, but the general results of my experience would seem to show that citric acid has a distinctly favorable action in these cases.

The great danger to the life of the patient in septic thrombophlebitis is pulmonary embolism, and embolism is distinctly favored by premature motion of the affected limb before organization of the clot is complete. It is, therefore, necessary to keep the patient at rest until complete organization of the thrombi must have taken place under all ordinary conditions, and then for a week longer to be absolutely on the safe side. It is generally fair to assume that after the temperature has been normal for at least a week and the swelling of the leg has practically subsided, and also the pain has entirely disappeared, that the danger of embolism is over, and the addition of a week's rest makes assurance doubly sure. In these cases, although the patient is usually very impatient to be up and about after her long confinement to bed, I find that a frank statement of the facts never fails to have the desired result and the patient is willing to remain at rest as long as seems best, even though it may not be necessary.

Abscess of the Uterine Wall.—Infection of the uterine wall with abscess formation is a not infrequent complication of cesarean section performed on patients who have been exposed to infection prior to the operation. It is particularly liable to occur when the uterine incision is so sutured that the endometrium as well as the musculature is included in the sutures.

The symptoms are slow in developing as a rule, unless the infective agent is a virulent streptococcus. The symptoms in the main are persistent elevation of the pulse and temperature, increased leukocytosis, moderate abdominal distention suggestive of pelvic peritonitis, and marked tenderness of the uterus. The outcome largely depends on the organism which causes the infection and the efficiency of the peritoneal suture. If the organism which causes the infection is a virulent streptococcus, extension to the peritoneum, or infection of the blood current is probable. If the organism is a staphylococcus or the colon bacillus, local pus formation is the rule, and the outcome, unless the abscess is drained, depends on the efficiency of the uterine suture. If the peritoneal suture has been carefully done and is well healed, the abscess will probably eventually point into the uterine cavity after the catgut sutures are absorbed, and the patient will recover after discharging a considerable amount of pus through the cervix. If the abscess formation is close

to the peritoneum, or if the peritoneum has not been carefully sutured, the abscess will point into the peritoneal cavity. Unless the condition is appreciated in such cases and the abscess drained, rupture into the peritoneal cavity will take place, and the patient die of peritonitis, unless operative relief is promptly given, and probably even then. This is presumably what takes place in the patients who are running a septic temperature and pulse with moderate distention, but with no abdominal tenderness except over the uterus. The patient seems only moderately sick, there is no vomiting, the bowels can be moved readily and no definite evidence of peritoneal involvement can be made out, until the patient is seized with sudden sharp abdominal pain and goes into collapse, the pulse becoming weak and thready and even disappearing. Prompt operation and drainage in these cases may save the patient even then, but by the time the surgeon sees the patient her condition is usually such that interference is manifestly hopeless, and she dies within a few hours.

Early recognition of the condition and operation with drainage is the indicated treatment, if the primary operation has been done through a high incision. If, however, the operation has been done through a low incision, as I believe is wise in all cases in which there is suspicion but not proof of antepartum infection, the uterus will become adherent to the abdominal wound in most cases and drain through it without infecting the general peritoneum.

In other cases the abscess is deep in the uterine wall and does not burrow in either direction. These patients run a septic chart and gradually lose ground as time goes on, dying eventually from the exhaustion of long continued sepsis or from a general septicemia, unless the uterus is opened and drained. In these cases the uterus should be either removed, or what is preferable, sutured to the incision, incised, and left open to be closed at a subsequent operation. In all of these patients a weak scar will remain in the uterus, which is very liable to rupture, if in subsequent pregnancies the patient is allowed to go into labor, and may even rupture during pregnancy, a fact which must be borne in mind in all patients who have had repeated sections for delivery. A febrile convalescence after cesarean section should be regarded as being possibly due to infection of the uterine incision, or as indicating a poor healing of the uterus with danger of rupture in case of future pregnancies. In these cases, at least, the policy of "once a cesarean section always a cesarean section" is the proper course to pursue, and the operation should be performed preferably before labor begins, and in any case before hard contractions have appeared, in order to reduce

the danger of uterine rupture to a minimum. There will always be in such patients a slight danger that the scar will rupture during pregnancy and the patients should be carefully watched throughout with this possibility in mind.

Septic Peritonitis.—Infection of the peritoneal cavity is a constant menace in all abdominal operations. With the improved aseptic technic of modern surgery this danger is reduced to a minimum, but even with the utmost precautions a slip in technic may occur and pass unnoticed with fatal results to the patient, and if the operative technic is any but the best the danger of infection is greatly increased. In clean abdominal surgery this risk is a slight one, but cases of infection occasionally occur in the practice of the most careful operators, and, therefore, the risk must be considered as always present when the prognosis of operation is under discussion, and the utmost care taken to guard against it.

In cesarean section it is possible for peritoneal infection to occur from four different sources, which must be recognized and guarded against as far as possible: (1) Direct infection of the peritoneal cavity by faulty technic at the time of operation is always possible, but should be exceedingly rare if the operation is performed by a competent operator with a well trained team of assistants in a properly equipped hospital. (2) Infection of the uterus may be present at the time of operation as a result of manipulations by the attendant, or from extension upward from the vagina in cases long in labor, especially when the membranes have been ruptured for many hours, and peritoneal infection may result from the escape of infected material into the peritoneal cavity when the uterus is opened. (3) In a third group of patients the peritoneal infection develops so late in the convalescence that it seems fair to assume that the operation and the uterus at the time of operation were both aseptic, but that the vaginal secretions contained the offending organisms and that an ascending infection followed operation, the uterine wound being first involved and later the peritoneum either by direct extension or by rupture of an abscess of the uterine wall into the peritoneal cavity. It is impossible to tell in advance which patients harbor organisms in the vagina likely to prove dangerous, particularly in the light of Williams' experiments, which seem to prove that the normal vagina during pregnancy does not contain pyogenic organisms. (4) Focal infection in other parts of the body may be the underlying cause of certain cases of peritonitis which develop when no other apparent cause can be found. It has been definitely proven in these focal infections that various joints may become directly infected as a result of an undrained septic process around decayed teeth or infected tonsils. It is, therefore, perfectly

possible that organisms may reach the peritoneal cavity by the blood current, and the peritoneal resistance being lowered as a result of the handling at operation, find a favorable soil for development.

In the first two varieties of infection the symptoms develop shortly after operation. The pulse and temperature begin to rise by the end of twenty-four hours. Abdominal distention develops early and increases steadily in spite of attempts at catharsis, and vomiting is apt to be an early and persistent symptom in spite of gastric lavage. Abdominal tenderness is present from an early period, but muscular spasm and rigidity develop late, if at all. The patient goes down hill rapidly and dies in a few days, unless the wound is reopened and the peritoneal cavity drained in the early stages of the infection, and even then the prognosis is grave at the best, while if the infective agent is a virulent one, it is practically hopeless from the first. In a few cases incision of the posterior vaginal vault with through and through drainage, the patient being placed in Fowler's position, may limit the spread of the infection and result in recovery.

In cases of infection due to slightly virulent organisms the symptoms are slower in their onset, although the convalescence is abnormal after the first day or two. For the first twenty-four hours or so the pulse and temperature are not unduly elevated and the condition may be mistaken for the ordinary reaction to contamination of the peritoneum with blood or uninfected liquor. By the end of forty-eight hours after operation it is fairly evident that infection is taking place from the uterus, and there may be beginning signs of peritoneal involvement, as shown by beginning distention. The bowels are usually to be moved without great difficulty, and gas is passed freely, though the distention recurs promptly after a short period of relief. Vomiting is not a prominent symptom, at least in the early stages. If the abdomen were drained at this stage the majority of patients would be saved, but since in the majority of cases in this condition the infection remains localized to the uterus and pelvic peritoneum, the surgeon naturally hesitates to reopen the wound for a condition the nature of which is doubtful, and, therefore, procrastinates until the extension of the process makes it evident that the patient is suffering from a diffuse and spreading peritonitis, when reoperation is usually too late and merely hastens the end.

In another group of patients of this class the symptoms are merely those of uterine infection, except for a moderate degree of intestinal distention, which may be no more marked than after a perfectly clean laparotomy. The pulse and temperature are elevated, there is no vomiting and the bowels are moving freely. There is no abdominal

spasm and tenderness is limited to the region of the uterus, and is little, if any, more marked than is noted in uninfected cases, though careful observation will show that it is increasing from day to day instead of growing less, as it should do, indicating abscess of the uterus.

In such cases, when cesarean section has been performed through a low incision, the uterus will often become adherent to the wound and eventually the abscess may drain through the wound in some instances, or it may drain through the uterine cavity. If the high incision has been employed, drainage must take place either through the uterus or into the peritoneal cavity, unless the abscess is drained by a second operation. If rupture takes place into the peritoneal cavity, the symptoms become acute. The patient who has previously been showing signs of an infection but who has not seemed unduly sick, is seized with sudden abdominal pain which may be extremely severe, and promptly goes into collapse, often becoming pulseless. The face is drawn and pinched and the general condition is so extremely bad that it is evident that to add to the shock by even a slight operation will inevitably prove promptly fatal. Relief for the pain should be given by morphia and active stimulation should be employed in the hope that the patient may react sufficiently to allow incision and drainage. If the reaction occurs, drainage may be employed, preferably under local anesthesia, but the outlook is not good. If the patient does not react, there is little use in attempting drainage, since any interference is usually promptly fatal.

In cases of infection secondary to the extension upwards from the vagina the symptoms are late in developing. The pulse and temperature are elevated, but usually only slightly so at first. The lochia may be suppressed and the condition mistaken for simple interference with drainage, due to lack of cervical dilatation. Dilating the cervix gives no relief, however, and the symptoms increase steadily, and unless the wound is opened and the peritoneal cavity drained the patient often dies, and sometimes even then.

Wound Infection.—Wound infection and stitch abscess are occasional complications of any abdominal operation, and cesarean section is not immune, in fact there seems to be a somewhat increased liability. This is probably due to the fact that there is in many patients an increased fat deposit in the abdominal wall during pregnancy, and fat is prone to become infected and break down. In addition many of these patients are operated on late in labor and the abdominal wound is exposed to infection, from the fact that, though it may be possible to protect the peritoneal cavity in infected cases, it is not possible to perfectly protect the abdominal wall and more or less infection is apt to occur.

If the infection is superficial, it is of no particular importance, except that it delays the convalescence and is to be treated as in other cases of wound infection, i.e., provision is made for drainage and the wound is allowed to close by granulation aided by tight strapping after the infection has cleared up. Secondary suture to accelerate healing may be of value in some cases.

If the infection involves the whole thickness of the abdominal wall, hernia in the scar is apt to be a sequence, since the wound must be opened freely and packed. Even in these cases, however, hernia may sometimes be prevented by tight strapping or by secondary suture after the infection has cleared up.

Acute Appendicitis.—Acute inflammation of the appendix may complicate the convalescence from cesarean section, just as it may occur at other times and should always be considered as a possibility in any patient who develops acute abdominal symptoms during an otherwise normal convalescence.

I have seen two cases in my experience. In one an abscess about a gangrenous appendix was found and drained, the patient recovering. The other patient was seen in consultation already moribund. The history in brief was that after three days of a normal convalescence the patient developed signs of an acute appendix but was not operated on, and after two days the appendix ruptured and general peritonitis developed, causing the death of the patient.

It must, therefore, be remembered that a patient is not, because she has had a recent cesarean section, immune to any other disease, but that acute symptoms suggestive of trouble outside the uterus should receive the same attention that they would call for under normal conditions, and that symptoms suggestive of an acute attack of appendicitis call for operative relief just as at other times. There is a natural hesitation to reopen the abdomen before the diagnosis is absolutely certain, especially when not all of the cardinal symptoms are present. Under ordinary circumstances spasm and rigidity of the abdominal wall over the inflamed appendix would have considerable weight in deciding the proper treatment. After a recent delivery, whether or not by the abdominal route, the relaxed condition of the abdominal walls renders spasm and rigidity of little value as guides to an underlying inflammatory condition, and if marked distention is present and the abdomen is tense, little or nothing can be learned by examination. In these cases the history of sharply localized pain and tenderness, unless the abdomen is markedly distended, taken in connection with the pulse, temperature

and leukocytosis, may call for an operation when the physical findings would hardly justify it.

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CHAPTER XI

STERILIZATION OF THE PATIENT AT THE TIME OF OPERATION

Sterilization Sometimes Justifiable—To Avoid Repeated Operations—Not Advisable at First Operation Unless Organic Disease Contra-indicates Future Pregnancies—In Cardiac Disease—In Chronic Nephritis—Methods of Sterilization.

No discussion of cesarean section can be complete without consideration of the advisability of sterilizing patients before the abdomen is closed when cesarean section has been performed, and the operator feels that if the patient becomes pregnant at some future time, cesarean section must be the means of delivery. A considerable literature has accumulated on the subject, some writers taking the ground that sterilization is never permissible under any circumstances, while others advocate it as a routine procedure at the time of the second, if not of the first, operation and still others believe that the question should be left to the patient and her husband for decision.

That sterilization is not a necessary procedure on account of the necessity of repeated sections is shown by the fact that series of operations are reported in which cases have been delivered three, four, and five times by section, and I have seen one patient who has had seven sections successfully. Furthermore, the risk of each successive operation is no greater than the risk of the primary operation, and in cases in which no organic disease contra-indicates future pregnancies the rights of the patient should be considered and the question should be left to her and her husband for decision, if they are of normal intelligence, since the patient has a right to decide whether she will undergo repeated pregnancies, each of which must end in cesarean section, or at best live in constant fear of the same, or be protected against the risks of pregnancy and repeated laparotomy. Abortion is not, in my opinion, to be considered as an alternative in these cases, unless the risks of repeated cesarean section are thought to be too great, and even then repeated abortion should never be considered, and the patient should be sterilized to avoid its necessity.

In general it may be said that a patient should not as a rule be sterilized at the time of the first cesarean section, unless some organic lesion

exists which renders the recurrence of pregnancy dangerous or undesirable. In healthy women the dangers of a second operation are so slight that I do not feel the attendant is justified in suggesting sterilization at the time of the first section, and even if the patient requests it, he should urge on her very strongly the disadvantages of a one child marriage and the fact that, if she is sterilized and the child should die later, it may prove a matter of lifelong regret to her that she can have no other children. He should be willing, however, if she asks for information, to give her definite instructions as to the best means of avoiding pregnancy, always informing her that no method of prevention is sure except abstinence from exposure.

If, however, any condition is present which renders future pregnancies dangerous to the life or health of the mother, e.g., heart lesions, chronic nephritis, etc., or if the cesarean section has been rendered necessary by the results of operation to repair the damage suffered at previous labors, and the patient has other living children, the attending surgeon is justified in urging the propriety of sterilization, or at least in suggesting the possibility of its performance, so that the patient and her husband, being in full possession of the facts, may consider the question carefully. In other words, if any condition is present which may possibly render future pregnancies dangerous to the life of the mother, or leave her in such a condition that she may be more or less seriously invalidated, the advisability of completing the operation by some procedure which, without adding to the immediate risks appreciably, will remove this source of danger for the future, is properly to be suggested.

In patients with cardiac disease who have had attacks of decompensation, either in the non-pregnant state or during pregnancy, sterilization at the time of operation should be most strongly urged as a life or health saving procedure. In these patients the strain of repeated pregnancies on the damaged heart is sure to be detrimental, and may prove fatal, and unless operation is refused, I do not feel that the surgeon has done his duty by his patient unless he leaves her in such a condition that the danger of repeated pregnancies is removed for good.

If a patient who has had one cesarean section comes to operation a second time, the attendant may be justified in suggesting the propriety of sterilization, even though she may be in perfect health. The operation should not be urged in these cases, but the facts should be placed squarely before the patient, and it should be left to her to decide whether, having two healthy children, she wishes to be left in a condition in which pregnancy may occur again, with or without her volition, and find it necessary to undergo the dangers and discomforts of future pregnancies with

the surety of an abdominal delivery at the end, or whether she prefers to know that pregnancy will be impossible in the future. In my experience the majority of women fear cesarean section so little that they prefer to undergo repeated operations in the absence of conditions which render pregnancy unduly dangerous, rather than feel that they will be deprived of the right of choice as to whether they will have other children, if at a later date it may seem desirable; and furthermore to many women the fact that they have been rendered sterile is more repugnant than the possibility of future sections, in spite of the risks which may arise, if pregnancy ensues.

There remains another class of patients, however, for whom the advisability of abdominal abortion and sterilization cannot be too strongly recommended. This group includes the patients who have serious organic disease, to whom pregnancy is a serious menace, and who face the alternative of death or invalidism if pregnancy occurs and is not interrupted. First in this class stand patients who have serious organic heart lesions, particularly mitral stenosis. Given a patient with a serious cardiac lesion who has had even a single severe attack of decompensation during previous pregnancies, or when not pregnant, and who, becoming pregnant again, suffers from cardiac symptoms early in this pregnancy, abortion and sterilization offer the only chance certainly for future health and possibly for life. If compensation can be maintained by complete rest with or without the use of digitalis it may be justifiable in occasional cases to attempt to carry on the pregnancy until the child has a good chance for life when the pregnancy should be terminated by cesarean section and the patient sterilized. The safer and therefore the wiser course is, however, to disregard the child and perform an abdominal abortion and sterilization early in pregnancy. If compensation fails in spite of precautions the pregnancy must be terminated as promptly as possible under the circumstances. Under these conditions an attempt should be made to restore compensation by absolute rest in bed. If the attempt is successful the pregnancy should be ended after the patient has been given a rest in bed of from two to three weeks. In case of failure to restore compensation the uterus should be emptied by the abdominal route under local or spinal anesthesia and sterilization carried out. The attempt to carry on to term or even to viability in these cases is too dangerous to be justifiable unless the patient demands it.

The same holds true in patients with advanced chronic nephritis who have had repeated miscarriages or still births. In these cases it must be remembered that each attempt at pregnancy increases the renal damage and shortens the patient's life. Since past experience has proved

that the chances of a living child are practically nothing, the mother's interests are the only ones to be considered, and the pregnancy may very properly be ended for the sake of reducing the damage which will be inflicted on her kidneys. Since a simple abortion leaves her in a condition to become pregnant again, it is an incomplete operation, and delivery by the abdominal route followed by sterilization is the indicated procedure.

Similar treatment may be called for in patients who have suffered from dementia at some previous time in their lives and who develop symptoms of a new attack during pregnancy. Such women should not be subjected to repeated pregnancies, even though the present one is not interfered with, and cesarean section followed by sterilization may properly be considered as the best method of delivery.

Methods of Sterilization.—Various methods of sterilization are possible and in general it may be said that each has advantages and disadvantages of its own under certain conditions.

Removal of the ovaries is the most obvious method, but is distinctly the least desirable of the methods to be considered, except in women with osteomalacia, in whom it may prove the cure of the disease. It is only justifiable otherwise in women at or near the menopause, in whom the ovaries are extensively diseased or when for some reason it is thought necessary to remove all the pelvic organs, as in early carcinoma, when the ovaries are removed, not for sterilization, but as part of an extensive operation in the attempt to eradicate the disease.

Inversion of the fimbriated extremities of the tubes and closure of the outer ends by suture has been recommended and in most cases is undoubtedly efficient. In some cases, however, it is conceivable that the closure may not be perfect or that the adhesions formed may be absorbed, cases having been reported in which pregnancy has followed such an operation, and since more certain means are available, this method is not to be advised. Burying the fimbriated extremities of the tubes in the broad ligaments has been suggested recently. In this operation a short incision is made in the peritoneal coat of the anterior surface of each broad ligament and the fimbriated end of the tube inserted, the peritoneum being sutured over all. It is a simple procedure and probably effective. This method has been particularly suggested for conferring temporary sterility on patients and if pregnancy seems desirable at some future time, the operation may be undone with a fair hope of success.

Double ligation of the tubes with division between the ligatures has been a common procedure, but in some cases the canal of one or both tubes has been reestablished and pregnancy has followed, showing that this method, though usually successful, is not to be depended on.

Supravaginal amputation of the body of the uterus is an absolutely certain method of preventing future pregnancies and is to be advised in certain classes of cases, especially when the body of the uterus is the seat of fibroid tumors, or when any suspicion of infection before operation is entertained. It has the disadvantage of adding somewhat to the risk of the operation, although the increase in risk is not great. It is not easily performed, and indeed may not be possible under local anesthesia and therefore is seldom indicated unless general or spinal anesthesia is employed. Furthermore some women insist on retaining the menstrual function which limits its use still further.

The most satisfactory method of sterilization is the excision of the proximal ends of the tubes from the cornua of the uterus by V shaped incisions. The wounds in the uterus are then sutured and covered with peritoneum and the ends of the tubes are buried in the folds of the broad ligament and covered with peritoneum. This is a simple procedure, which adds only a few minutes to the length of the operation and nothing to its risks; it does not interfere with future menstruation and is absolutely certain in its results. It has the further advantage that, if the patient desires at some future time to have children, a second operation to implant the tubes in the uterine cornua may be performed, and offers a slight chance of success, although nothing can be promised from it.

Of course, it may be urged that such operations are unnecessary and improper, and that the true remedy against pregnancy lies in continence on the part of the patient and her husband. This is a perfectly proper criticism in the cases in which sterilization is performed because the patient fears future cesarean sections and wishes to avoid them. However, in patients to whom pregnancy is a serious menace and whose lives may be sacrificed if conception occurs unless an abortion is promptly done, sterilization is, in my opinion, not only justifiable but almost obligatory since in these patients nothing should be left to chance and they must be protected against themselves. It is very easy to adopt a high moral tone and argue that abstinence from intercourse is the simple and easy method of solving the problem, but experience has proved otherwise, and I have seen too many lives sacrificed because the physician contented himself with advice as to what must not occur, without taking steps to see that his advice was taken, not to feel that, if I am willing to say to a patient and her husband that pregnancy must under no circumstances occur again, I have failed in my duty to such a patient unless I am also willing to permanently remove the danger. This is particularly the case when the abdomen is already opened and the added procedure entails no added risk to the patient.

CHAPTER XII

SPECIAL METHODS OF OPERATION

Porro Operation—Supravaginal Hysterectomy—Indications—Technic of the Porro Operation—Technic of Supravaginal Hysterectomy—Panhysterectomy—Bibliography.

It has been generally recognized, ever since Porro published his monograph in 1876, that under certain conditions removal of the uterus in part or as a whole after the performance of cesarean section adds greatly to the safety of the patient. When Porro first described his operation the maternal mortality of cesarean section was so appalling, that abdominal delivery was considered only when all other methods had been tried and had failed, leaving cesarean section as the only chance for the patient, the only alternative being to allow her to die undelivered. The introduction of the Porro operation led to such an improvement in the results of abdominal delivery that for a time it enjoyed marked popularity, and although the technic has been modified to keep pace with the improvements in surgery, the operation for amputation of the uterus at about the level of the internal os is still commonly spoken of as the Porro cesarean section.

Experience with the conservative cesarean section has proved that the high mortality of early days was due to two factors; first, that the operation was seldom or never performed on favorable cases, but was an operation of last resort, only to be considered for patients in whom attempts at delivery by other means had proved futile; and second, because the uterus was not sutured, but was dropped back into the abdomen at the end of operation, to act as a source of hemorrhage and infection. Furthermore, asepsis was unknown. Taking these facts into consideration, the wonder is not that the mortality was so great, but that any patients survived.

The Porro operation was devised to eliminate the danger of returning the probably infected, bleeding uterus to the abdomen, and fulfilled its purpose excellently.

When Säger published his great work in 1882, which forms the basis of the modern cesarean section, it was enthusiastically received and the Porro operation was largely given up. Further experience

proved, however, that in patients who were already infected at the time of operation the results of the conservative operation were unsatisfactory, and the modified Porro operation was revived for use in those cases. At the present time the operation of supravaginal hysterectomy has superseded the earlier Porro operation, but the indications for its performance are the same.

Indications for Removal of the Uterus.—The performance of an abdominal delivery on patients already known or supposed to be infected is contra-indicated whenever any other means of delivery, even of a mutilated child, is possible, unless the child is in good condition and the parents elect that its life, for religious or other reasons, compensates for a very serious risk to the mother, after having had the facts carefully explained to them. If the life of the child is chosen at the possible expense of the mother, or if the pelvic contraction is so marked that delivery from below is impossible, or carries with it dangers believed to be practically as great as those attendant on cesarean section under the circumstances, the operation may be properly undertaken, a very grave prognosis being given. In these cases, however, it should either be performed extraperitoneally or, preferably, the uterus, instead of being sutured and returned to the abdominal cavity, should be amputated and removed, since it adds greatly to the danger, if the infected uterus is replaced in the abdominal cavity, to act as a source of peritoneal infection.

In other cases, as for instance when the pregnant uterus is the seat of multiple myomata which require operation in any case, the conservative treatment is cesarean section followed by supravaginal amputation, to save the patient from the dangers of a second abdominal operation at a later date for the removal of the tumors.

In cases of premature separation of the placenta, for which cesarean section has been performed, it will occasionally be found that, on account of the disintegration of the uterine musculature by the hemorrhage which has taken place into it, the contractile power of the uterus has been destroyed and the uterus cannot be stimulated to contraction. To return such a uterus to the abdominal cavity, even after suture, is merely to invite disaster from postpartum hemorrhage, and the only safe treatment is removal of the uterus.

Atony of the uterus with increased hemorrhage is also seen in certain other conditions, notably overdistention of the uterine musculature, whether as a whole or in part. The action of the uterus should be carefully watched, therefore, after the delivery of multiple pregnancies or in cases of hydramnios, and particularly in cases of sacculation of the

uterus, in which the section was necessitated by dystocia following fixation of the uterus to the abdominal wall in faulty suspension operations. In the latter class of cases the development of the anterior uterine wall during pregnancy is seriously interfered with, if not practically prevented, by the firm adhesions between it and the abdominal wall, and the posterior wall, which has been markedly overdistended, is very thin and has in some cases practically lost its power of contraction. This condition predisposes markedly to postpartum hemorrhage and the uterus should be stimulated to contraction by all possible expedients: If, however, it does not contract satisfactorily within a reasonable time, and especially if any appreciable amount of hemorrhage occurs, a supravaginal amputation should be promptly performed, since it is an absolutely unsurgical procedure to replace a relaxed and bleeding uterus when it has proved impossible to provoke adequate contraction, whether mechanically or by the use of drugs.

Porro Cesarean Section.—The operation as described by Porro—for removal of the uterus—is seldom performed at the present time, but no discussion of cesarean section would be complete unless it contained a brief description of its technic.

Until the child is delivered the steps of the operation are identical with those of the conservative cesarean section. In the Porro operation, however, it is not necessary to remove the placenta from the uterine cavity, since the body of the uterus is to be amputated, although this may be done if the operator prefers. As soon as the child is delivered an elastic ligature is tied tightly around the upper portion of the cervix. The infundibulopelvic ligaments are now ligated and cut through and the uterus is then amputated a short distance above the elastic ligature. A long knitting needle is now passed through the stump and allowed to rest on the abdominal walls, preventing the cervix from slipping back into the abdominal cavity, the remainder of the wound being closed by sutures in the ordinary manner. In a short time the stump and elastic ligatures slough off, leaving a depressed wound, which heals by granulation.

The operation is a simple procedure and quickly done, but owing to the long and complicated healing process necessary and the unsightly appearance of the resulting scar, which is deeply retracted beneath the proper level of the abdominal walls, it is rarely employed at the present time.

Supravaginal Hysterectomy.—The Porro operation has been practically superseded in modern times by supravaginal amputation of the body of the uterus, the tubes and ovaries being left. Practically the same

technic is employed as in the non-pregnant condition, and if the Trendelenburg position is used the operation will be much facilitated.

The child is delivered as in the ordinary conservative operation, except that, in the cases of supposed infection of the uterus, a sufficiently

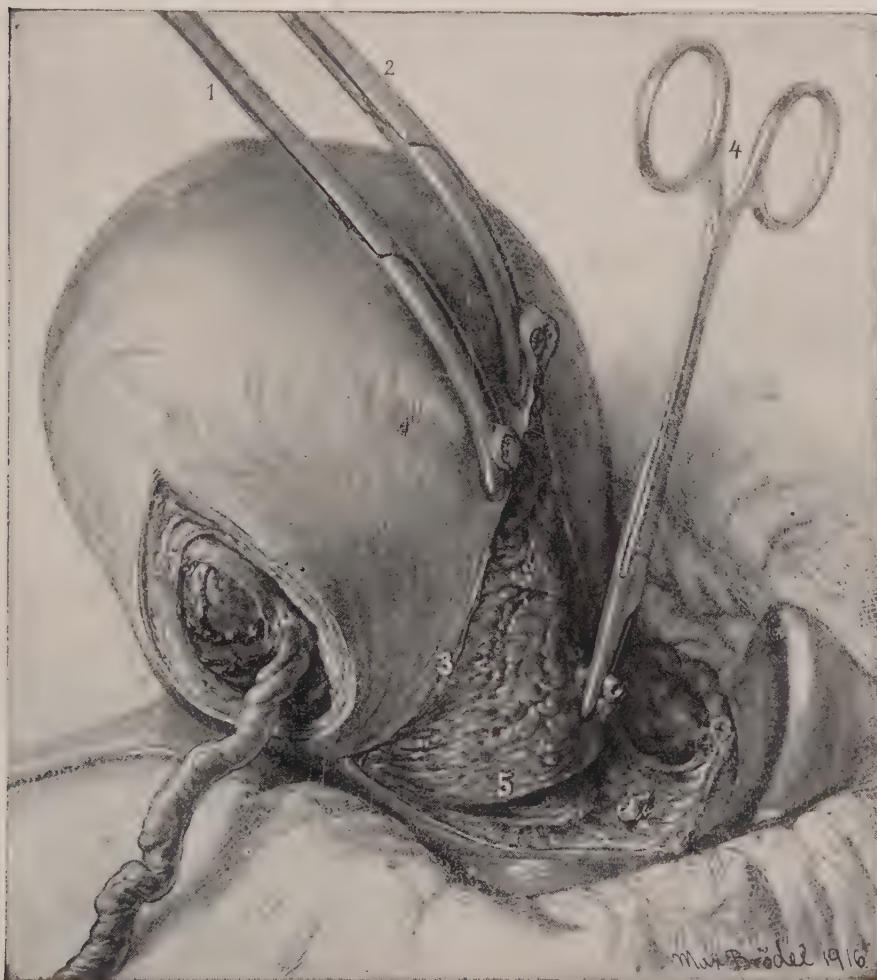


FIG. 33.—CESAREAN SECTION WITH SUPRAVAGINAL HYSTERECTOMY: TUBES AND OVARIES RETAINED: PLACENTA UNDELIVERED.

1, Round ligament clamped; 2, tube and broad ligament clamped; 3, anterior peritoneal flap; 4, uterine artery clamped; 5, incision in cervix.

long abdominal incision is made to permit the delivery of the unopened uterus from the abdomen and the complete protection of the peritoneal cavity by gauze packing, so that the danger of infection of the peritoneum by the infected uterine contents is reduced to a minimum. The placenta

is ordinarily left *in utero*. The patient is now placed in the Trendelenburg position. The fallopian tubes, ovarian, and round ligaments on each side are ligated a short distance from the uterus, clamps are placed close to the uterus, and the tissues between the clamps and ligatures are divided. The broad ligament on either side is divided down

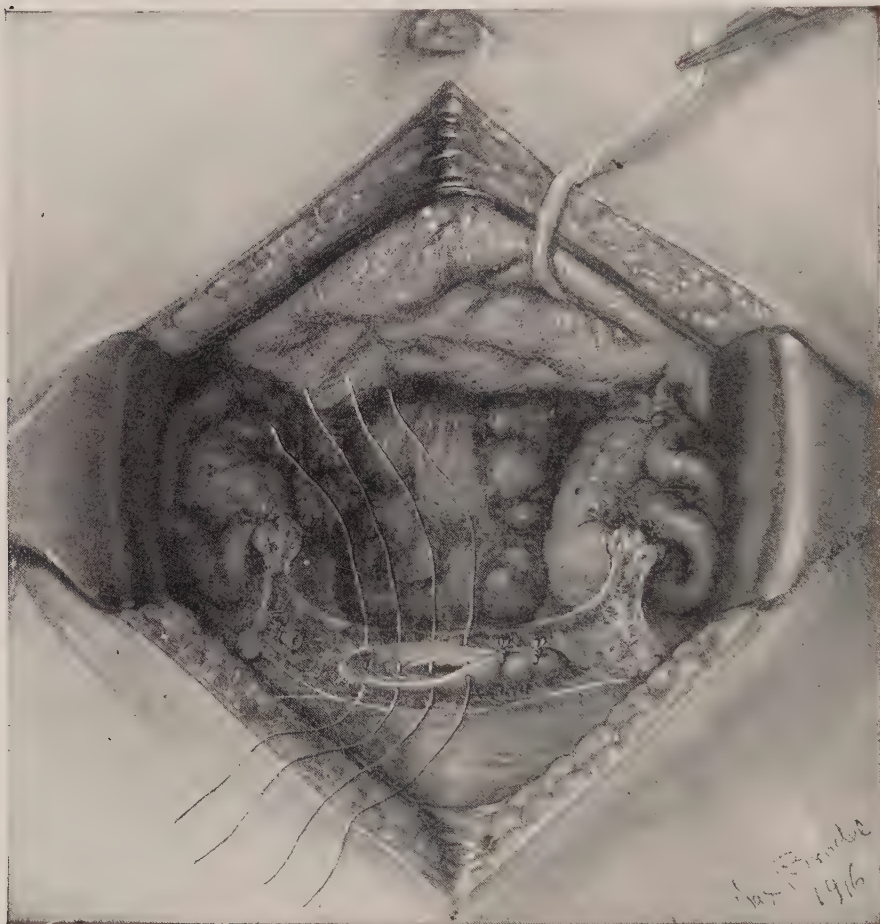


FIG. 34.—CESAREAN SECTION WITH SUPRAVAGINAL HYSTERECTOMY.
Method of suturing cervical stump: tubes and ovaries intact.

to its base. A curved incision is now made across the anterior surface of the uterus just above the bladder reflection and a peritoneal flap peeled off by blunt dissection. The uterine arteries are then isolated, tied, and cut, and the body of the uterus is amputated at the cervical junction. The cervical canal is cauterized, either by the actual cautery or by crude carbolic acid, and the stump is sutured so as to close and bury

the canal by the necessary number of catgut sutures, covered by the peritoneal flap, and then dropped back into the peritoneal cavity. The broad ligament wounds are closed with continuous catgut sutures. The gauze packing is then removed and the pelvic cavity is sponged out carefully and the abdominal wound closed. In infected cases it is a wise precaution to sponge out the pelvis with 70 per cent alcohol or ether and a small amount may be left in the abdomen.

The operation is a simple one for the operator who has had a proper surgical training and can be completed more quickly than a conservative cesarean section. The relaxed condition of the pelvic floor and the abdominal walls makes it possible to bring the upper part of the cervix out through the incision, so that the entire operation can be completed on the surface of the abdomen, instead of deep in the pelvis, as in the non-pregnant condition. In spite of the improved results which follow the extraperitoneal methods of cesarean section in doubtful cases, the danger to the patient of leaving the uterus in cases of frank infection is so great that I believe this to be the operation of election for infected cases.

Total Hysterectomy.—Removal of the entire uterus after cesarean section was first done by Bischoff. The operation is somewhat more difficult than supravaginal amputation and carries with it a distinctly higher mortality. It is, therefore, seldom done except in cases of early carcinoma of the cervix, which are considered operable, or in rare cases of infection when it is felt that retention of the infected cervix will militate against the patient's chances of recovery. As a rule, if performed under thoroughly aseptic technic, the results are satisfactory. Owing to the fact that the vaginal vault is opened, a careful vaginal preparation must be performed before the operation is undertaken.

The technic is identical with that of supravaginal amputation of the uterus, except that after ligation of the uterine arteries the vaginal vault is incised and the entire uterus removed. The opening into the vagina is now closed with catgut, the broad ligament wounds are sutured with a continuous catgut suture, and the abdomen is closed.

Some operators prefer total hysterectomy in all cases, urging the possibility of future cancer of the cervix if the cervix is left behind. Cases of cancer of the cervical stump are reported from time to time, but I feel that this danger is less than the increased immediate mortality of the more radical operation.

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CHAPTER XIII

EXTRA- AND TRANSPERITONEAL CESAREAN SECTIONS

History of Extraperitoneal Cesarean Section—Unnecessary in Clean Cases—Not Efficient in Frankly Infected Cases—Indications for Extraperitoneal Operations—Methods of Operation—Extraperitoneal Operation—Küstner's Modification—Latzko's Operation—Transperitoneal Operation—Hirst's Modification—Bibliography.

In the preceding chapters the discussion has practically been limited to the classical cesarean section with its indications and limitations, both of which it is possible to define with a reasonable degree of accuracy, and it would seem as if little more could be added which would prove of value. During the last few years, however, many operators, beginning with Frank in 1907, have been experimenting with various modifications of the operation, in the hope of widening the field of its indications by the discovery of some method by which the obvious disadvantages might be eliminated when it is performed on patients who do not come within the favorable class. These procedures aim at protection of the peritoneal cavity, so that a living child may be delivered by the abdominal route from uteri already infected, or thought to be probably infected, without subjecting the mother to the dangers which are recognized as unavoidable when the classical operation has been performed on unfit or doubtful cases. The various procedures have been designated extra- or transperitoneal sections, according to the method employed in reaching the uterus before it is incised. In the former the attempt is made to reach the lower segment of the uterus by separation of the peritoneum from its pelvic attachments, without opening the general peritoneal cavity, and to remove the child from the lower uterine segment after dissecting the bladder from its attachments to the anterior wall of the uterus; while in the latter the peritoneal cavity is opened in order to reach the lower uterine segment, but is closed by suture, clamps, or packing before the uterus is incised, in the hope that the child can be removed from the infected uterus and the uterine wound closed and buried under the bladder without contamination of the peritoneal cavity, thus diminishing to a large extent the danger of peritoneal infection. The results of these attempts have proved interesting and to a certain extent significant, but a more extensive period of experimentation is necessary before the classi-

attempts have proved interesting and to a certain extent significant and at the present time the majority of obstetricians feel that the classical operation has only a limited field, the low cervical operation being preferable in the great majority of cases. When the placenta is situated in the lower segment, or when extensive adhesions render access to the lower segment difficult or impossible, the classical operation is to be preferred. The same holds true when there are fibroids of considerable size in the lower segments and also when it is desired to excise scars of previous incisions from the uterine wall which have not healed in a satisfactory manner, in cases in which hysterectomy is refused by the patient or seems undesirable.

Experience has proved that the classical cesarean section is a relatively safe operation when the rules, which have been formulated in the previous chapters, are followed, and the majority of bad results are due to a lack of appreciation of the rules, or to a deliberate disregard of them. A certain mortality, however, attends the operation, even when it is performed on patients believed to be absolutely favorable.

The present feeling in regard to the low cervical operations is that they offer a slightly greater degree of safety even in clean cases; that in doubtful cases there is a very considerable improvement both in mortality and morbidity; but that they do not protect the patient adequately in frankly infected cases, hysterectomy being the only proper operation in these, if abdominal delivery is absolutely necessary. In addition there is little question but that the convalescence is rendered distinctly more comfortable and the morbidity is lowered.

No series of cases large enough to be absolutely convincing has been published, since it is a well known fact that a number of surgeons have performed the classical operation successfully on series of a hundred or more patients without mortality, only to meet with misfortune eventually. Time alone can show the true merits of the newer operations and whether they deserve a permanent place among obstetric operations, but the evidence in their favor is increasing.

It is natural that most of the pioneer work in developing the extra-peritoneal operations should have been done in Europe, owing to the conditions under which obstetric practice is carried on in most of the European countries, where the majority of parturient women are cared for by midwives, who, while they may be carefully trained in the aseptic care of normal childbirth and the convalescence following it, are not well trained in the study of the pelvis and in prenatal work. The average patient is allowed to go into labor without any attempt being made to ascertain in advance whether any disproportion exists between the child

and the pelvis, and her needs are only discovered as a general rule when labor fails, and after repeated vaginal examination under relatively poor asepsis a medical consultant is summoned. I say "relatively poor asepsis" because my personal experience leads me to believe that the asepsis of the continental surgeons does not compare favorably with that of American surgeons, and, therefore, no matter how well trained a midwife may be in other respects, her asepsis cannot be first class. It is a fact that in Germany, at least, the development of fever during labor is one of the legal requirements which necessitates a medical consultation. This, of course, means in many cases that infection of the uterus has already occurred, and if cesarean section is performed by the classical method under these conditions, the mortality is sure to be high. The bad results necessitated by such a routine naturally led to the trial of various expedients, in the hope of developing an operative procedure which would improve the statistics materially and thus greatly extend the field for abdominal delivery by increasing the safety of the patient. One method after another has been tried with varying degrees of success, until finally two distinct types of operations have been developed, either of which, in the hands of its advocates, shows distinct promise, but neither of which has yet been proven to fulfill all that has been hoped for it.

Up to the present time no method has been devised by which a child can be removed by an abdominal operation with entire safety to the mother from a uterus which is already infected by a virulent organism. Even when it has been possible to reach the uterus without opening the peritoneal cavity, infection of the peritoneum has occurred with fatal results in a certain number of cases by extension from the uterus, and since it is very common for the peritoneal cavity to be opened in spite of all precautions, direct infection is even more liable to occur. It is still too early to predict with accuracy what the final status of this operation will be, but it is doubtful if it will ever supersede cesarean section followed by hysterectomy in the patients who are believed to be frankly infected at the time of operation, although Küstner reports a mortality of only two in 112 operations by his method, and states that at least one half of his patients were in such condition at the time of operation as to render them bad risks for the classical cesarean section.

The results of other operators are less satisfactory than those reported by Küstner, and even amputation of the uterus in frankly infected cases gives a mortality of over 20 per cent. This would seem to suggest one of two things, either that the cases in Küstner's series, though doubtful risks for classical operation, were not infected with a virulent organism, or that his method of operation has very distinct

advantages over the ordinary methods employed and may eventually prove to be the operation of election for doubtful cases.

In cases in which the uterus has already been infected by a virulent organism, especially the streptococcus, no abdominal operation can be expected to give satisfactory results. In such cases cesarean section is contra-indicated, if any other method of delivery is possible, even though it may involve a destructive operation on a living child. This is especially true since experience has shown that in many cases of antepartum infection the placental vessels are invaded by the infecting organisms before delivery is accomplished, resulting in the death of the child from septicemia a few days after birth, even though it may have been in apparently good condition.

The improvement in results which has followed the abandonment of curettage as a routine procedure in the treatment of puerperal infection by the streptococcus, and the substitution of medical for surgical treatment, is suggestive of the fact that the manipulation of the uterus necessary to the performance of cesarean section by any method, which is not followed by the removal of the uterus, must result in such an increase in the process as to increase the mortality greatly. Furthermore, the opening up of extensive raw surfaces for infection must result in such a rapid spread of the infection as to make cesarean section in the face of virulent infection an exceedingly desperate operation. Removal of the uterus under these circumstances offers the best chance for the patient, if the abdominal route is selected, but even then a mortality of twenty per cent results.

In cases of infection with organisms of slight or moderate virulence better results are obtained after operation by any method, although there is little doubt but that the classical operation will give worse results than extraperitoneal section, both as regards mortality and morbidity, and in doubtful cases the latter operation is to be preferred, unless hysterectomy is considered desirable for any reason.

In cases in which there is no evidence of infection and yet the patients have been in labor for some time and have been subjected to repeated vaginal examination, even under good asepsis, the results of the classical cesarean section are only fair, the morbidity being relatively high and the mortality showing an appreciable increase over that obtained by operation at the time of election, and an extra- or transperitoneal operation, with protection of the peritoneal cavity against infection, may well be employed as promising better results.

In conclusion it is fair to say that the extraperitoneal or low cervical operations if performed as elective procedures on clean cases show only

slightly better statistics than the classical operation, and excellent results will be obtained by either method; that in cases of low grade infection or doubtful cases the results from the former will be distinctly better; and that in virulent infections no abdominal operation will give good results, but that on the whole the best results will be obtained by hysterectomy, the uterus being delivered from the abdomen before being incised for the delivery of the child, and the peritoneum carefully protected from contamination by gauze packing.

Although obstetric patients in this country are much more liable to be under the care of a physician than of a midwife, the lack of appreciation of the importance of prenatal study and selection of the method of delivery best suited to the patient before the onset of labor, is so widespread that a great majority of the patients who require cesarean section come to operation in little, if any, better condition than those under care of a midwife.

The extraperitoneal section is not a panacea for all obstetric complications and many cases are sacrificed yearly to a combination of the lack of prenatal study plus ignorance of the dangers of cesarean section on unfit cases, the operator either not recognizing these dangers, or not being willing to sacrifice a child for the sake of saving the mother by performing craniotomy on the living child.

More is to be hoped from the education of the physicians of this country in the importance and methods of prenatal study of the patient than in any other one field in obstetrics, but it is also probable that education in operative technic and instruction in the choice of operation applicable to the given patient under the conditions which are present would largely reduce the excessive mortality which exists at the present time.

Methods of Operations.—There are two general types of so-called extraperitoneal operations in vogue at the present time. One is intended to be a true extraperitoneal operation, although the peritoneum is often opened by mistake, and the other is in reality a transperitoneal operation, in which the general peritoneal cavity is protected from infection by suture of the cut margins of the parietal peritoneum to the cut margins of the uterine peritoneum before the infected uterus is opened. The latter is the easier method and will be found quicker and more simple in the average case, but the former undoubtedly protects the peritoneal cavity more completely, and, therefore, should show better results in well trained hands. The poorly-trained surgeon will find it a difficult and unsatisfactory procedure, and in cases of infection of the uterus

by a virulent organism, even the uninjured peritoneum may become infected by extension from the infected uterus, and the patient die of peritonitis, although the peritoneal cavity has not been opened. This demonstrates the fact that no method of abdominal delivery is safe in cases of virulent infection of the uterus, and, therefore, in these cases abdominal delivery is to be avoided, if delivery can be otherwise accomplished, craniotomy being the operation of choice in cases in which no other method of delivery through the pelvis is possible, even though the child may be alive. The maternal mortality following craniotomy, even on infected cases, is less than that following any abdominal operation under similar circumstances, and the chances of the child, even if delivered by cesarean section under these conditions, are rather poor, many children dying of infection a few days after birth. Therefore, the operator should not consider the interests of the child, but should perform craniotomy, if the pelvis is large enough for the delivery of a mutilated child, i.e., if the true conjugate is above 5 centimeters.

In impossible pelvis abdominal delivery is necessary and in these cases supravaginal amputation or total hysterectomy offers a better chance for the mother. This limits the field for the extraperitoneal operation to cases which belong in the doubtful class and to those in whom the conservative operation is relatively safe, though perhaps the statistics of the low cervical operations will show a slightly reduced mortality as compared with the classical operation even in clean cases. I believe that the true extraperitoneal operations have no advantages over the low cervical operations in any type of case and have sufficient disadvantages to warrant discarding them entirely.

The great field for the low cervical operations will always be on cases neither known to be infected nor known to be clean, but who belong in the doubtful class. In this group should be included patients who have been for a long time in labor, on whom repeated vaginal examinations have been made, especially under doubtful asepsis. It also includes patients in whom the membranes have been ruptured for a considerable length of time and patients on whom attempts at delivery have been made, even under good asepsis.

In other words, low cervical cesarean section is indicated in patients in regard to whom there is some suspicion that uterine infection may be present but who show no symptoms which definitely point to its existence, if the child is in good condition and shows no signs that its vitality may have been compromised by the efforts at delivery to which it has been subjected, whether spontaneous or operative.

According to some authorities pubiotomy is preferable in doubtful cases in which the true conjugate of the pelvis is above 7 centimeters, a rule which would limit the extraperitoneal indications still further, but pubiotomy is an operation which as yet has not been enthusiastically received by most obstetricians; and there seems little chance that it will ever attain any great degree of popularity.

Although the extraperitoneal section was first advocated by Frank in 1907, Nicholson in 1914 was able to collect some twenty modifications; and the end is not yet. This in itself proves that no one technic has been discovered which is agreed on by all operators as ideal for all patients. In general the operations may be divided into extra- and transperitoneal operations.

There is nothing to be gained by describing here each modification which the operation has undergone, and I shall merely describe what seem to me the most satisfactory procedures that have been evolved for each type.

(1) **EXTRAPERITONEAL CESAREAN SECTION.**—Küstner's modification of extraperitoneal section has given very satisfactory results on appropriate cases, its originator having reported 112 cases with two deaths.

According to Küstner, one-half of the cases operated on were apparently appropriate for the conservative operation, and the remainder were of such a nature that he would have hesitated to perform the classical operation on them. Two deaths in 56 doubtful cases is a very satisfactory showing and suggests that the operation deserves a further trial.

The technic of the operation is as follows: The patient (who should be well advanced in labor) is etherized and the abdomen prepared. She is then placed on the operating table in the Trendelenburg position. Unless the bladder is distended with urine, 150 cubic centimeters of sterile salt solution or boric acid are introduced into the bladder. A vertical incision is made just outside the outer border of the left rectus muscle, extending 12 centimeters upward from Poupart's ligament. The deep layer of fascia is incised with care, the object being to expose, but not open the peritoneum. The reflexion of the peritoneum from the abdominal wall to the viscera and the left side of the bladder is now visible. By means of scissors and gauze dissection the left side of the bladder is dissected off from the anterior surface of the lower uterine segment and drawn well beyond the midline by a retractor. The peritoneal reflexion is

pushed upward as far as possible and the anterior surface of the lower uterine segment is exposed by retractors. An incision is made in the

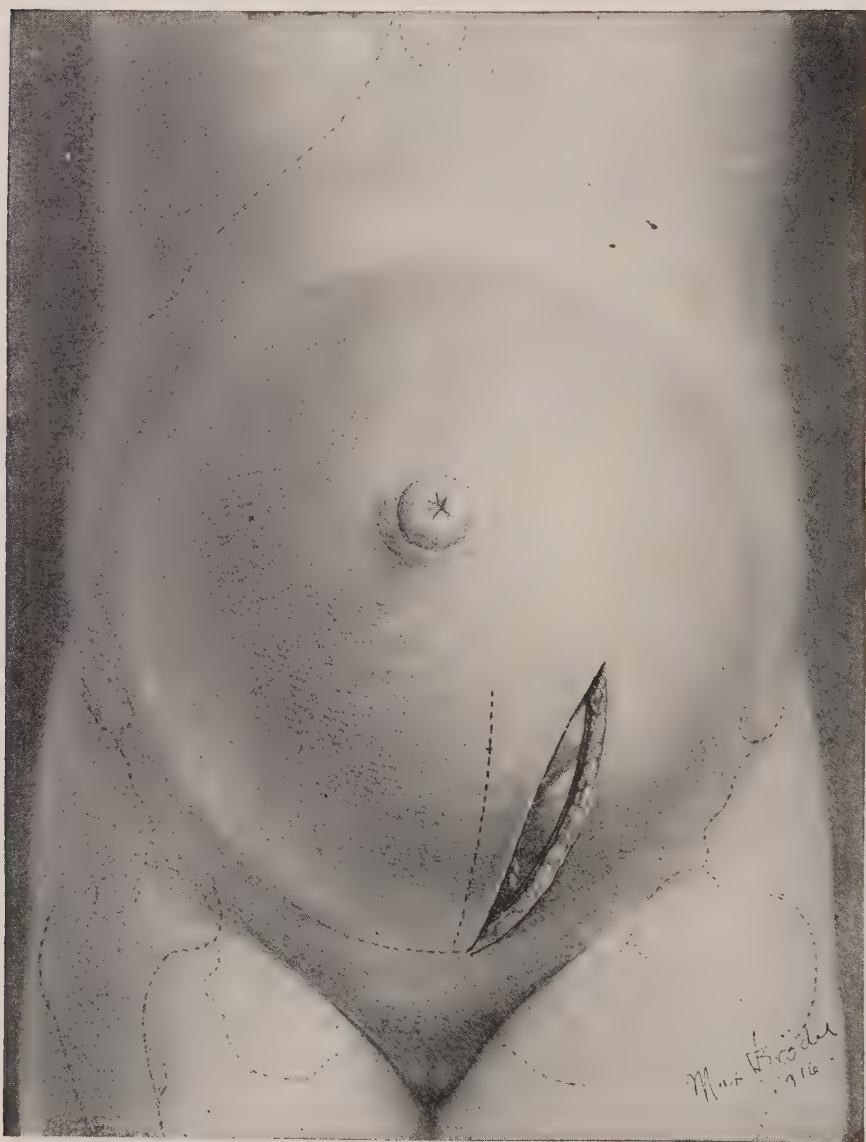


FIG. 35.—KÜSTNER'S OPERATION.
Skin incision.

midline and the child is extracted by forceps. The incision in the lower uterine segment must be very carefully made, owing to the extreme thinness of this portion of the uterus, it being never more than a few

millimeters thick, as any carelessness may result in cutting the child. The placenta is now removed, the uterine wound is closed in two layers by catgut sutures, and the abdominal wall is closed in layers, except at the lower angle of the incision, a small gauze drain being inserted into the deepest part of the wound.

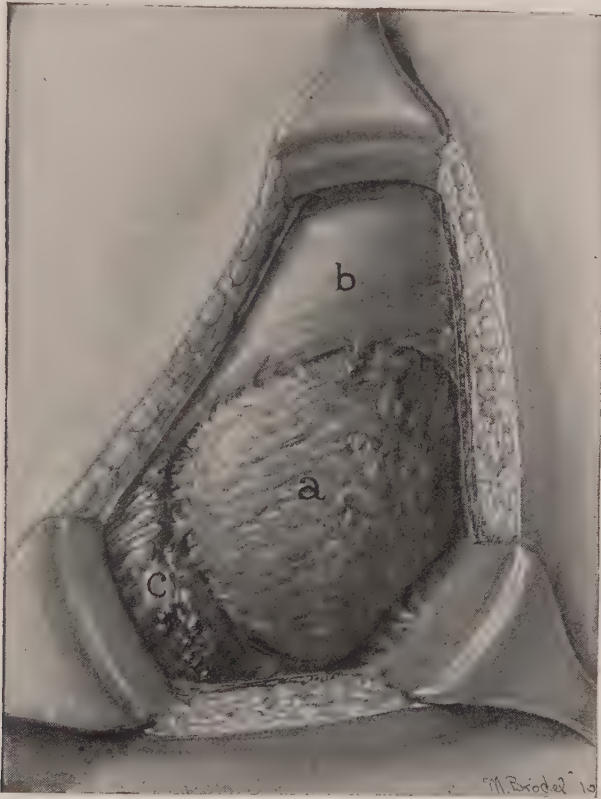


FIG. 36.—KÜSTNER'S OPERATION.

a, Lower uterine segment; b, peritoneal reflection;
c, bladder drawn toward center.

The amount of hemorrhage is usually not excessive and is easily controlled. There is always some danger of injuring the bladder and of opening the peritoneal cavity, but if the dissection is made with care neither of these accidents should occur. During the separation of the bladder the left ureter and uterine artery are visible in most cases and, therefore, should be safe from injury, but carelessness may result disastrously. The employment of the Trendelenburg position during the operation is almost imperative. The operation can be performed in the

ordinary dorsal position, but the difficulties are so much increased that neither the operator nor the patient has a fair chance.

This operation is probably the best of the extraperitoneal methods, and in cases in which the propriety of the classical method is doubtful it may often prove of value, but it has certain definite disadvantages. It should not be substituted for the conservative operation in clean cases

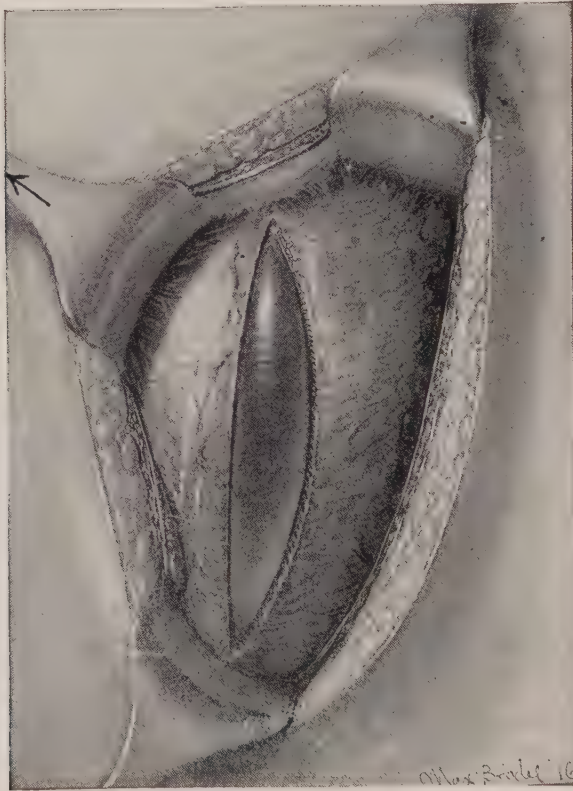


FIG. 37.—KÜSTNER'S OPERATION.

Incision in uterus low down.

and should be undertaken only by well trained surgeons; second, the bladder is sometimes injured, even in trained hands; third, the wound must always be drained, and if infection occurs, the patient must undergo a prolonged suppurative process, to which she may succumb, or as a result of which she may be invalided for a long time; and fourth, the extensive adhesions which result make its repetition impossible in subsequent labors. It is, therefore, an operation only to be done when the risks of the classical operation seem too great and yet the patient is not frankly infected with a virulent organism. Its employment in proper

cases may result in limitation of the number of cases in which pubiotomy is recommended as a substitute for a late cesarean section.

LATZKO'S OPERATION.—Although Küstner's technic seems to me to offer the best chance of reaching the lower uterine segment without undue risk of injury to the bladder or of infection of the peritoneal cavity, Latzko's operation is considered preferable by some operators. In this procedure the abdomen is opened either by a transverse or longi-

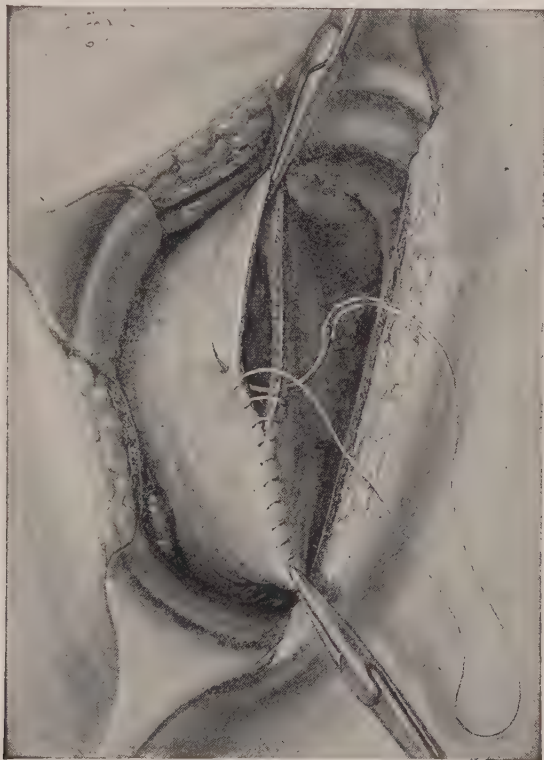


FIG. 38.—KÜSTNER'S OPERATION.

Introduction of uterine suture.

tudinal incision just above the pubes, carried down to but not through the peritoneum. The peritoneum is now separated from the bladder and pulled up out of the pelvis. The bladder is separated from its attachments to the lower uterine segment by gauze dissection and pushed to the right. The vesico-uterine fold of the peritoneum is then retracted upwards toward the umbilicus, leaving a denuded area made up of the lower uterine segment and upper cervix, a median incision of which affords sufficient room for the extraction of the child with forceps. The placenta is then extracted, the uterine wound sutured in two layers and

the abdomen closed. Drainage is necessary only in patients believed to be infected when operation is undertaken. The operation is not usually a difficult one, since in patients who have been for some time in labor the pelvic peritoneum can usually be readily separated from the



FIG. 39.—LATZKO'S OPERATION (I).

(From De Lee's "Obstetrics," copyright by W. B. Saunders.)

underlying structures, but if infection of the pelvic connective tissue occurs the convalescence will prove long and exhausting. Increasing experience with the transperitoneal low cervical operations has convinced me that the true extraperitoneal operations afford no advantages and offer much greater technical difficulties.

TRANSPERITONEAL OPERATIONS.—The difficulties of the true extraperitoneal operations have led to an attempt to devise an efficient trans-

peritoneal operation which would give equally good results in doubtful cases. The theory of these operations is that the uterus shall be reached by the transperitoneal route, but that before the uterus is opened the peritoneal cavity shall be protected by suture of the uterine peritoneum

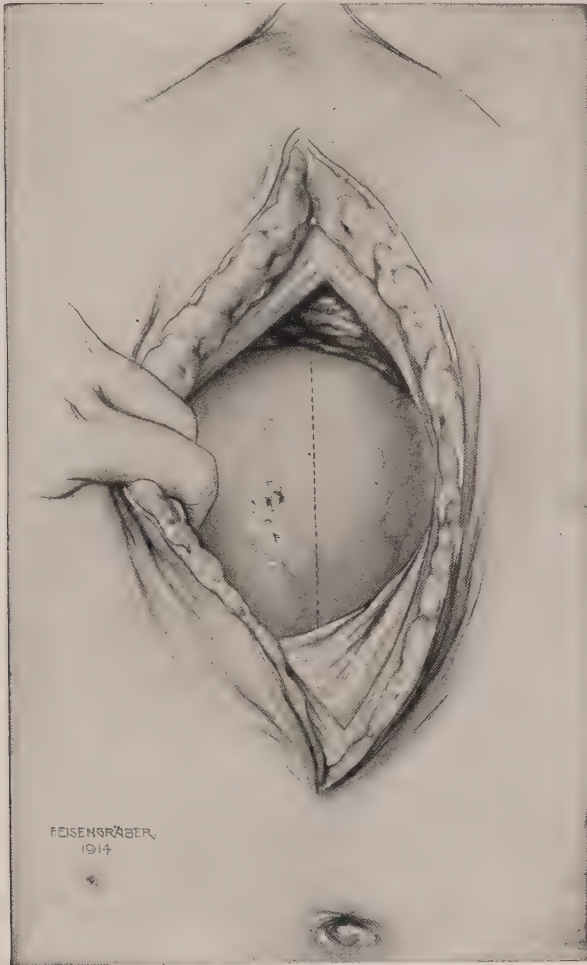


FIG. 40.—LATZKO'S OPERATION (II).

(From De Lee's "Obstetrics," copyright by W. B. Saunders.)

to the parietal peritoneum, in such a manner as to shut off the general cavity from contamination by the uterine contents, or protection may be provided in some other manner.

The principal variations in this operation consist in differences in the method of incision of the abdominal wall and uterus and in the method of suture at the completion of the operation, which are largely

details of minor importance with the exception of the site of the uterine incision. I have selected Hirst's modification of the technic employed in the Veit-Fromme operations as a fair representative of the operations of this type.

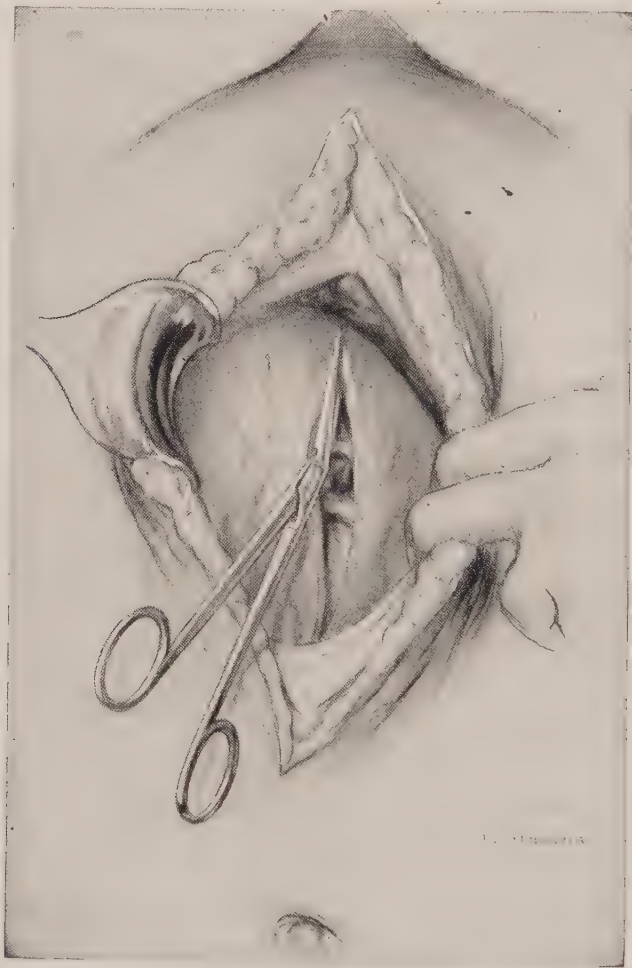


FIG. 41.—LATZKO'S OPERATION (III).

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The abdomen is opened by a longitudinal incision from slightly below the umbilicus to the symphysis, long enough to permit the easy extraction of the child. A longitudinal incision is then made through the visceral peritoneum of the lower uterine segment, which is easily separated from the uterus, especially after several hours of labor, of the same length as the incision in the parietal peritoneum. The edges of the cut flaps of parietal peritoneum are then united by a continuous catgut

suture of the edges of the uterine peritoneum, thus cutting off the peritoneal cavity from the field of operation, unless it is torn into during the extraction of the child. A longitudinal incision is then made in the lower uterine segment and upper cervix and the child is extracted by forceps.

In the Veit-Fromme methods the peritoneal flaps are clamped until after the child is extracted, when they are sutured. The union of the



FIG. 42.—LATZKO'S OPERATION (IV).

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peritoneal flaps not being water tight when the uterus is opened the operation can hardly be called extraperitoneal, but the late suture protects the peritoneal cavity from infection during the convalescence to a certain extent. Unless time is a great object, the Hirst modification is a distinct improvement.

After the child and placenta are delivered, the incision in the lower uterine segment is closed in layers and the peritoneum closed over it. Some operators prefer to remove the stitches closing the peritoneal

cavity and suture, first the visceral and then the parietal peritoneum, as in the classical operation, but this would seem to do away with much of the advantage gained in the primary closure of the peritoneum and to increase the danger of infection. The suturing together of the two peri-



FIG. 43.—LATZKO'S OPERATION (V).

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toneal sacs in the midline would seem to be the more logical method, and I can see no disadvantages in it.

The one objection to this method of operation which is apparent is, that the opening in the peritoneum is often not large enough to permit the extraction of the fetal head without tearing, thus opening the general cavity, and this accident has been reported several times. If this hap-

pens, the advantages of this method are largely done away with, since the opening into the peritoneal sac permits easy contamination of the peritoneum as a whole. This is to be prevented by making as large an opening as possible in the peritoneum, and, according to Hirst, suturing the peritoneal layers, as above described. After the peritoneum is closed the abdominal wall is closed without drainage.

This method of delivery possesses certain very definite advantages over the true extraperitoneal methods. First and most important is the ease with which it can be performed. Any surgeon who is properly

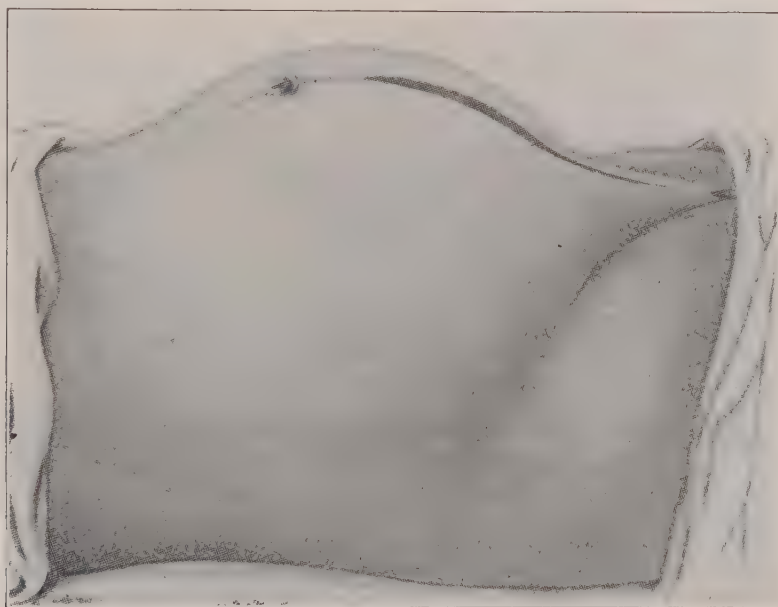


FIG. 44.—HIRST'S OPERATION (I).

Abdominal incision.

qualified to perform a classical cesarean section can do this operation when it seems desirable, a fact which does not hold true of any of the true extraperitoneal operations, which are often technically difficult and require special training on the part of the operator. It may properly be urged that cesarean section should only be performed by thoroughly qualified surgeons, but the fact must be recognized that there are in many communities surgeons who are sufficiently trained to perform a classical cesarean section in emergency, but who are not qualified to perform a more complicated operation. It is, however, unfortunately true that in such communities the need of a primary cesarean section is seldom recognized and the very type of case in which an extraperitoneal

operation would be indicated in skilled hands is the most common. This fact renders the transperitoneal section the operation of choice in such communities, although experience may eventually prove the extraperitoneal operation to be the better in proper hands.

Aside from the technical difficulties, the greatest objection to the extraperitoneal operations lies in the fact that the bladder is not infrequently injured, even by skilled surgeons accustomed to the operation,



FIG. 45.—HIRST'S OPERATION (II).

Incision in parietal peritoneum.

and the ensuing complications often add greatly to the discomfort of the patient, if nothing more. This danger is avoided in the transperitoneal operations and this fact must be counted distinctly in their favor. In neither type of operation is the peritoneal cavity absolutely safe from contamination, since it may be opened accidentally when either procedure is carried out with resulting infection, or in cases of virulent infection of the uterus peritonitis and death may result from extension of the infection through the intact peritoneum, although the operation may have been perfectly performed. Another advantage of the transperitoneal

route is that drainage of the wound is unnecessary, whereas it is necessary in the extraperitoneal operation of the Küstner type, and perhaps after the Latzko operation, and drainage may result in infection of the connective tissue of the prevesical space in patients who might otherwise escape infection and result in a prolonged suppurative process, which may result fatally. Furthermore, the extensive adhesions left after the Küstner operation limit its application to a single operation.



FIG. 46.—HIRST'S OPERATION (III).

Incising visceral peritoneum over lower uterine segment.

an objection which does not hold true, however, in the Latzko operation. Finally, if it is desired to render future pregnancies impossible, sterilization can only be performed at a second operation.

In the transperitoneal method the operation may be repeated in subsequent pregnancies if desired, and if it is thought best to sterilize the patient without removing the uterus, this can be done before the visceral peritoneum is opened, which obviates a second operation for this purpose and adds nothing to the risk of the operation. This contingency is hardly liable to arise, however, if the operation is limited, as I believe it should be, to those cases which, though not frankly infected, are con-

sidered poor risks for a classical operation. In these cases the best procedure, if sterilization is considered advisable, is supravaginal amputation of the uterus, since there is no advantage to the patient, except that of retaining the menstrual function, in sterilization by a method which leaves behind a probably infected uterus to act as a possible source of

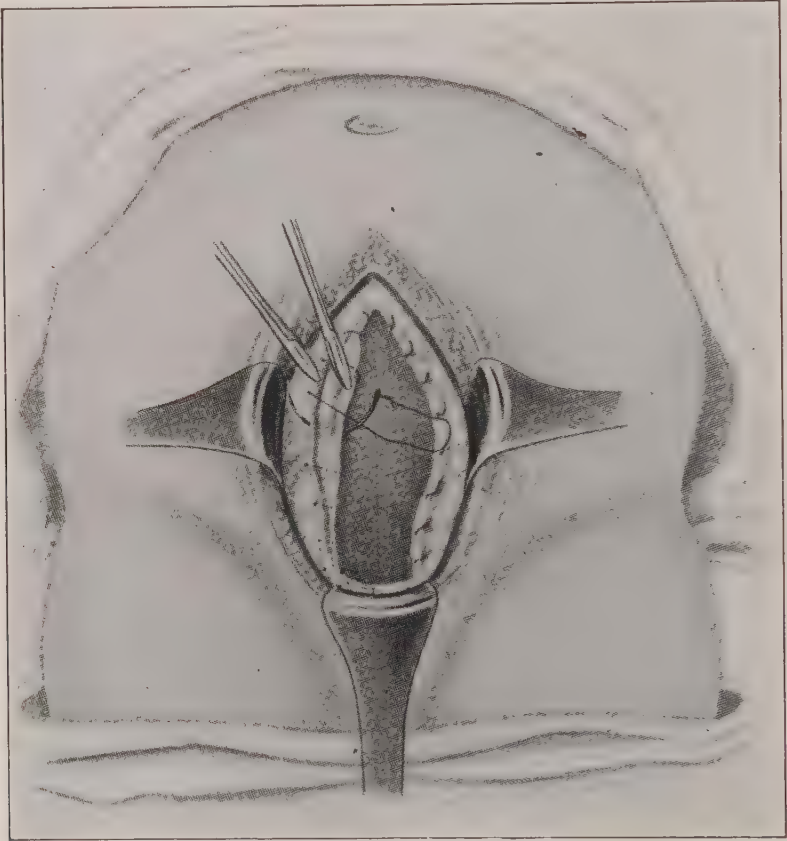


FIG. 47.—HIRST'S OPERATION (IV).

Uniting parietal and visceral flaps to close off peritoneal cavity before incising lower uterine segment.

peritoneal infection and death, and the patient's desire to retain the menstrual function should have no weight in the decision, unless the uterus is known to be uninfected, or at least believed to be so.

Neither operation is suitable for frankly infected cases, since, if the infective organism is virulent, the danger of peritoneal infection is serious, even though the general cavity is protected, and the risk to the patient in suturing the uterus and returning it to the abdomen to act as a source of infection is too great to be considered. Hysterectomy is the

only proper operation in these cases and should always be performed when cesarean section is necessary in frankly infected cases, although in patients who are in such poor condition when operation is undertaken that it is feared the shock of hysterectomy may be fatal Sellheim's operation may be done. In this procedure the uterine incision is not closed, but the margins are sutured to the skin edge, producing a uterine fistula which may be left open indefinitely or closed at a subsequent operation, when the septic infection has been overcome. A very limited experience with this operation has convinced me of its value in the type of case above mentioned, and there is reason to believe that it may prove a satisfactory substitute for hysterectomy in a certain proportion of infected patients, who object to removal of the uterus because they hope to have other children.

The principal disadvantages of this operation are that—the infected uterus not being removed—the patient must first overcome the septic process and then at a later date be subjected to a secondary operation for closure of the uterine fistula. Furthermore, it would seem probable that, if pregnancy should occur at a later date, there would be a distinct danger of rupture of the uterus during pregnancy, which might prove fatal.

There are certain types of patients for whom the classical cesarean operation is preferred, even by the most ardent advocates of the extra-peritoneal operations. Whenever speed is an object the classical cesarean section should always be selected. Therefore, if the child is believed to be in any but first class condition, the quickest method of delivery should be selected. In cases in which the mother is in doubtful condition for a prolonged operation, as for instance in cardiac cases, or in cases of premature separation of the normally situated placenta, the most rapid method should be selected. In cases of placenta previa the increased vascularity of the lower uterine segment renders high incision preferable and the extraperitoneal operations have no place. In most other conditions the choice of operation depends on the personal preferences of the operator, and in clean cases with no suspicion of infection I am satisfied with the results of the classical operation and can see no reason to change to an extraperitoneal operation. (See also page 201.)

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CHAPTER XIV

PRINCIPLES GOVERNING CHOICE OF OPERATION

Objects to be Sought in Any Obstetric Case—Prenatal Study of Patient and Choice of Method of Delivery Best Fitted for Individual—Age of Patient—Size of Pelvis—Size of Baby—Advantages to Given Patient of Various Methods of Delivery—Primary Operation—Operation After Modified Test of Labor—Bibliography.

As obstetrics is ordinarily practiced, it is assumed that every pregnant woman is a good risk for childbirth until symptoms arise which call for special treatment, and these symptoms are often not appreciated until it is too late for a satisfactory result to be obtained. For the best good of our patients every woman should be looked on as abnormal for childbearing until a painstaking examination proves that her interests will not suffer, if she does not receive special care. Then, and only then should she be treated as a routine case.

The question which must always be answered in any obstetrical case is, what method of delivery is best suited to the needs of the individual patient when all the circumstances of the case are taken into consideration. In deciding this question, various factors present in the individual case must be given due weight, since the problem is a fundamental one, and the lives or future well being of both patients may depend on the conclusion which is arrived at. The rights of both mother and child must be considered on the one hand and the various obstetric procedures which are possible under the given conditions on the other, and the choice of procedure made to ensure the best results possible in the light of the obstetric skill which is obtainable and the conditions under which the patient must be delivered.

There are three objects to be sought in every obstetric case: first, the life of the mother; second, the life of the child; and third, the health of both mother and child. Any result which falls short of attaining these objects is to a certain extent a failure, at least from the standpoint of the patient, and must be considered as such, although there exists in every community a certain number of women to whom pregnancy will prove a serious menace, and who will suffer severely in health and perhaps lose their lives, unless their needs are recognized and the pregnancy is terminated at an early date. These patients, who may be classed as the

definitely unfit, must be treated according to their individual needs and the pregnancy must be ended by the most conservative method as soon as the patient can be classified, and future pregnancies must be forbidden, or better yet made impossible, if the contra-indication is a permanent one. In many of these patients abdominal hysterotomy and sterilization, even in the early months of pregnancy, offers the best method of treatment, the patient being delivered and protected against future danger from the same source at one operation, which is desirable, if such a course of treatment is considered safe for the patient.

Whenever the patient's condition is such, at the time when delivery is decided on, that an abdominal operation is not considered advisable, the pregnancy should be terminated by a vaginal operation and the sterilization deferred until some future time, in the hope that the patient's general condition may so improve in the interval as to render the completion of the procedure possible in comparative safety, the patient being sterilized as the best means of protection, and in fact sometimes apparently the only one. Sterilization to avoid the dangers of a possible pregnancy and abortion may seem radical, especially as many members of the medical profession take the ground that the patient herself must adopt such measures as are necessary to prevent pregnancy and the responsibility of failure shall rest on her and her husband. Repeated experience has shown, however, that in a certain number of cases the ordinary means of prevention fail, and the physician is faced with the responsibility of repeated abortion or of sacrificing his patient, if his medical conscience does not permit of this. In my opinion neither of these courses is justifiable, and I believe that whenever pregnancy is forbidden as being probably fatal for the patient, the only rational treatment is to render it impossible, provided the contra-indication is a permanent one.

The great majority of women, however, are perfectly good obstetric risks and can safely undergo pregnancy and labor as long as they are under efficient observation and can receive intelligent care. Every patient should be carefully studied, however, with reference to her individual needs and peculiarities, so that nothing may be overlooked which may further her interests or those of the child. It is a fact which should never be lost sight of that, although a patient is apparently perfectly normal and a favorable outcome both for mother and child may be confidently predicted, abnormalities may arise at any time which require careful attention and often prompt treatment, if a successful outcome is to be attained. Even in an apparently normal case the attendant must be prepared at any moment to depart from a policy of watchful waiting when any possible advantage may be gained for the patient by such a

course, and he must not be committed to a single method of treatment for all patients, but must be prepared to meet appropriately any situation which may arise. Probably more harm is done because the average physician is not properly qualified to recognize and meet the needs of the individual case and, therefore, treats all patients according to his own limitations, than by any other single factor in obstetrics. This inability to depart from routine practice for incipient symptoms often results in the loss of the golden opportunity for the patient, and renders necessary difficult operations in the face of serious abnormalities, which, if recognized and treated early, could have been dealt with in a simple manner without danger to either patient.

Between these classes of patients there is a large group of patients who, for one reason or another, are relatively unfit for the burdens of pregnancy and labor and who must receive careful and intelligent oversight during pregnancy to avoid disaster, since if their needs are not recognized early and met adequately, the ultimate result will be more or less unsatisfactory. At the time of labor these patients must be accorded the care suited to their individual needs, and a failure on the part of the attendant to recognize that they require special attention is often followed by an unsatisfactory recovery from the strain to which they have been subjected and more or less prolonged ill health, if nothing worse. These are the patients who must be handled with the greatest skill, since if an error of judgment is made either during pregnancy or in the selection of the method of delivery best suited for them, the result of the pregnancy will often prove a failure.

The modern improvements in operative technic have brought the obstetric art to a point where a well trained obstetric surgeon need no longer hesitate to recommend a certain course of procedure to a patient for the reason that it is not absolutely necessary in his opinion, when it is the wisest course to pursue and promises the best ultimate results, even at the cost of a slightly increased immediate risk. Every obstetrician of experience can remember patients in whom the end results have been far from satisfactory to both the patient and himself; and yet in the care of these cases no apparent indication existed for not following the traditional obstetrical rules, but he failed to recognize the special conditions which called for unusual treatment in the given case. A few such experiences are enough for any obstetrician who works with his head rather than with his hands, and his future patients should benefit by his errors of judgment; but unfortunately in most instances the unfortunate result is considered hard luck and future patients gain nothing. From the standpoint of so conducting the case that the maternal

and fetal lives were preserved the results have been successful, but we must remember that, unless the mother is brought through her labor in such a condition that she is able to resume her ordinary activities within a reasonable time, the conduct of the case has resulted in at least a partial failure, and the result argues an error of judgment on the part of the attendant, if not a lack of careful observation of his patient. Errors of judgment, if not so frequent as to show incompetence, are pardonable, but carelessness and neglect are not.

It is not enough that the patient should be studied from the standpoint of whether labor is possible or not, by determining the adaptation between the fetal head and maternal pelvis in deciding on the proper course of treatment in a given case, but also the fitness of the patient to undergo a severe strain, whether from a physical or nervous standpoint, and the probable effect of labor on a patient's after life must be estimated. The relative importance of the child in the individual case, the condition of the mother's soft parts with relation to probable injury, and the probable effect on her of the discomforts attendant on such injury, as well as the existence of any organic lesion in the mother which may be affected adversely by the strain of labor, are factors which enter into the problem in every case. All of these factors must be taken under careful consideration before the date of labor is reached and the wisest method of delivery determined on for each individual patient, so that if an operative delivery is selected in preference to a normal labor, as offering distinct advantages for the patient, it can be undertaken at the time when it promises the most nearly ideal results.

If labor has already begun before the question of the best method of delivery for the individual patient is taken under consideration, various other factors complicate the problem, since, although a certain procedure may be ideal at the time of election in a given case, it may be far from such under the conditions present when the problem is forced on the attendant, and only absolute necessity may warrant it. The length of time the patient has been in labor, the degree of progress already made as compared with the severity of labor, and the patient's reaction to labor, must all be taken into account. Physical exhaustion of the mother may contra-indicate an operation which would be unquestionably the most satisfactory for the patient at the beginning of labor. If the membranes are unruptured, the number of vaginal examinations and the probable asepsis which has been observed, as well as the condition of both mother and child, must have serious weight in the decision. If the membranes have been ruptured for some time and vaginal examination has been practised, this fact, together with the condition of the uterus, the

presence or absence of a constriction ring, and the degree of thinning which the lower segment of the uterus has undergone, must be estimated in choosing the safest method of delivery for the patient. When mother and child are in good condition the choice of operation should be such as to conserve the interests of both, except in the occasional case when preservation of the life of the child will evidently jeopardize the mother's life. In such cases the method of delivery should be chosen which will give the mother the best chance, even though it may carry with it a serious increase in the danger to the child or even deliberately sacrifice its chances. To deliberately choose an operation for the sake of the child which will add materially to the danger to which the maternal life is subjected is poor policy, for, of the two, the mother is the more important. Cases may arise in which circumstances may seem to warrant such a course, but it should never be undertaken without a full explanation of the conditions which call for a decision to both the patient and her husband, and their preferences must be given due consideration.

The environment of the patient is another factor of considerable importance. If the surroundings of the patient are such that an aseptic operation can be performed and proper after care provided, the choice of operation may be made according to the physical findings in the given case, but if the conditions are unsatisfactory for the maintenance of proper asepsis, an abdominal operation which would be advisable under other circumstances should be abandoned without hesitation, if any other method of delivery can be undertaken with a reasonable chance for the mother, even though it may involve the sacrifice of the child. Unfortunately most operators can only see one course of treatment to be followed in doubtful cases and the patient does not receive intelligent study before this course is adopted, with the result that cesarean section in general practice is attended by such a high mortality as to render it an unjustifiable procedure in many communities, whereas a careful consideration of all the factors present in the individual case would result in greatly increased safety for the mother at a moderate increase in fetal mortality.

When a patient is under observation during pregnancy there are usually several methods of delivery possible in the average case, and the patient should be carefully studied, in order to ascertain which method promises the best results under the given circumstances, the decision as to the course to be adopted being made before the patient goes into labor if possible, subject to change should conditions seem to warrant it before serious complications arise. In the great majority of cases it is possible to classify the patient more or less accurately after careful examina-

tion, especially under anesthesia, although it may not always be possible to say whether pelvic delivery is possible or not. It is usually fairly easy to ascertain whether the presenting part and the pelvis bear a proper relation to one another, since the pelvis can be measured and the size of the child more or less accurately estimated, and then the method of delivery will depend on the estimated character of the labor, the probable resistance of the patient to the strain of a not unduly difficult labor, the effect of pain on a nervous organization which is more or less definitely abnormal, the desirability of avoiding all strain in the given case, and the probable risk to the baby if labor is attempted. -

In a certain number of cases even the best trained obstetrician will be in doubt as to the wisest course to pursue, and may feel it best to permit the patient to go into labor for a few hours and observe progress, as well as the reaction of the patient to labor, before making his final choice, the labor being carefully observed and preparations made, so that the indicated treatment may be carried out promptly when the decision is reached. Such a course gives the patient the advantage of every opportunity for careful attention, and although a prolonged test of labor renders cesarean section more dangerous than if done at the time of election, a few hours of moderate labor, the progress of which is followed by rectal examination, so that all danger of vaginal contamination is avoided, will have a negligible influence and does not eliminate it as a proper elective procedure. On the other hand, repeated vaginal examinations, or an attempt at operative delivery per vaginam, so increase the risks of abdominal delivery that the conservative section is usually contraindicated and a low cervical operation should be performed, if the abdominal route is preferable for other reasons. There is no doubt but that, in cases in which the true test of labor is applied, i.e., several hours in the second stage, the results of the classical operation are unsatisfactory. In these cases, provided no evidences of uterine infection are present, the low cervical operation promises much improved results and seems to be the operation of election.

Every obstetric patient should be considered as possibly abnormal and requiring special treatment until, after careful examination and consideration of the various factors present, no conditions requiring special treatment can be found. The age, physical and nervous condition of the patient, and the relative importance of the child in the given case, must be taken into account as well as the relation between the size of the child and the maternal pelvis. The probable effect of a difficult labor on the future health of the mother, as well as the probable effect of pelvic injury, must be taken into consideration and be given due weight in de-

ciding what is the wisest method of effecting delivery in the individual case, since although both mother and child may be brought through alive, serious invalidism may result from an improper choice.

Several courses are open for choice in the great majority of patients, if intelligently studied in the last few weeks of pregnancy, and the method of delivery to be employed in the given case should be carefully selected, with not only the immediate result, but also the patient's future welfare in view. Of course, in the majority of patients no abnormality will be found, of sufficient degree at least to call for any special treatment, and the patient may be allowed to go into labor with every expectation of a spontaneous or easy operative delivery; but it must be remembered that labor may prove unsatisfactory, even in the most apparently normal patient, and must be carefully supervised from the beginning, in order that no departures from the normal may escape detection at an early stage, and that appropriate treatment may ensure a successful outcome, instead of an emergency operation being rendered necessary when the patient is no longer in good condition. On the other hand, there will be found a certain number of patients who are so definitely abnormal in some way as to require special treatment. Patients who show a definite physical abnormality, whether due to pelvic disproportion, chronic or acute disease, or whether it is a result of previous operative procedures, must receive special study and the method of delivery be carefully adapted to their individual needs. It must not be forgotten in these patients that, although a normal pelvic delivery may be possible, the effect on their after health may be such as to leave them more or less seriously invalided, a misfortune which might and probably would be avoided if the proper method of delivery had been selected.

In the same category belong the patients with a lowered nervous resistance, to whom the burdens of their ordinary life are all or more than they can successfully cope with. These patients, if submitted to the strain of even an easy labor, may become chronic invalids, a misfortune which might have been avoided if their needs had been recognized and the strain of labor avoided.

These abnormal patients may be subdivided into several groups, according to their apparent needs, but it must be borne in mind that although a given patient may be classified as accurately as possible, circumstances may arise which will call for a complete change of treatment at any period of labor, and the most careful observation must be maintained not to lose the golden opportunity.

According to the estimated degree of abnormality in the given case, several courses of treatment are open: (1) The patient may be allowed

to go into labor with the understanding that, if progress is normal, a not too prolonged first stage will be permitted, and the second stage eliminated by a prompt operative delivery as soon as cervical dilatation is attained. It must be understood, however, that if the progress of labor proves abnormal, an entire change of policy may be necessary at any time, and possibly a cesarean section selected as the best means of delivery. This method of treatment will prove very satisfactory in a large group of subnormal women, in whom no pelvic disproportion is present; but if a patient who in other respects is subnormal comes to labor with an unengaged presenting part, which will either necessitate a prolonged second stage or a difficult pelvic operation, she should be reclassified at once as a poor risk for a pelvic delivery and be considered as a proper risk for a cesarean section. An unengaged presenting part in a primipara, who is in other respects abnormal, may well call for an abdominal delivery, even though examination shows that no serious disproportion exists, since, the patient already being classified as a doubtful risk, it is unwise to subject her to the strain of a labor which promises to be of more than average severity, as is the case when the presenting part is not engaged at the beginning of labor.

(2) In certain doubtful cases where the patient is perfectly normal except for a slight disproportion between the pelvis and the presenting part, which the obstetrician confidently believes will be overcome by the uterine forces, if labor is satisfactory, labor may be permitted under observation, the progress being followed by rectal examination, thus avoiding vaginal contamination in case a few hours of labor results in little progress and abdominal delivery seems to be the best solution of the problem. This is particularly true in the case of a young primipara in whom no serious pelvic obstruction can be made out, although the presenting part remains high during the early part of labor, since it not infrequently happens that a relatively difficult primiparous labor may be followed by easy labors in subsequent pregnancies, and in a perfectly healthy girl who can undergo a hard labor without serious after effects, cesarean section should be undertaken only for very definite indications, since such a course involves a similar delivery in subsequent pregnancies. In such a patient labor may be allowed to go on, if progress seems to be normal, in order to mold the head into the pelvis, on the understanding that a pubiotomy followed by forceps or version may possibly be necessary as the best method of delivery for such a patient, rather than a late cesarean section, if the uterine forces are not sufficient to mold the head into the pelvis.

(3) In other cases labor may be permitted for a few hours, in the

hope that a short trial will prove that the physical equipment of the patient is more efficient than the results of the preliminary examination would warrant, on the understanding that, if the results are anything but perfectly satisfactory, a complete change of policy will be made and the patient delivered by cesarean section, whether classical or extraperitoneal, according to the time of rupture of the membranes and the amount of vaginal interference, etc., which has been resorted to.

(4) The performance of an elective cesarean section is the method of choice in all cases in which the outcome of labor is considered seriously doubtful, whether from the standpoint of maternal health, or of fetal life. Undoubtedly the adoption of this policy will result in a few unnecessary operations, even in the most careful hands, but the results obtained in the preservation of fetal life and maternal health for the many will more than counter-balance the unnecessary operations which result from an occasional error in judgment. The present status of cesarean section is such that, under proper conditions, a favorable result may be confidently predicted when the operation is undertaken at the time of election. On the other hand, the results of labor, when definite disproportion exists between the child and the pelvic canal, are relatively unsatisfactory, both for the life of the child and the after health of the mother, since a difficult operative delivery often results in such serious injury to the maternal tissues, even if otherwise successful, as to more or less seriously invalid the patient. Under such conditions, although cesarean section may not be absolutely necessary in a considerable proportion of cases, it would seem to be the wisest method of treatment.

In a patient whose pelvic measurements are normal, or only slightly shortened, and little disproportion exists between the child and the pelvis, the choice of the method of delivery to be adopted depends on other factors. If the patient is apparently in sufficiently good physical and nervous condition to be subjected to the strain incident to a labor of rather more than moderate severity without serious after effects, even though she may not be fully up to the normal standard, labor may be permitted under observation, with the reservation that, if her powers show signs of failure before the completion of labor, operative interference will be undertaken and the baby delivered by forceps or version, as may seem best at the stage of labor she has attained, with pubiotomy or even craniotomy as an operation of last resort in case of failure of delivery by the ordinary methods. It is almost needless to say that no obstetrician would be justified, under modern conditions, in deliberately allowing a patient to go into labor with the prospect of a possible craniotomy under consideration before labor began; but it is always possible, though not probable, in

these patients whose equipment is somewhat below par, that circumstances may arise during labor to render necessary the prompt delivery of the child to save the life of the mother; and unless the patient is in a first class hospital, which might warrant a change of policy to abdominal delivery at short notice, this is not justifiable, and after failure to deliver by forceps or version, craniotomy may, in rare cases, be indicated for the benefit of the mother.

In patients whose general physical equipment is normal but in whom a moderate degree of disproportion exists between the fetal head and the pelvis, labor may be permitted with the expectation that the head will mold into the pelvis and permit an easy extraction from below, if not a spontaneous delivery. If the progress of labor is satisfactory in the early hours and if the cervix is dilating as rapidly as it should for the degree of energy expended, labor may be allowed to go on until the second stage is reached. If after a reasonable time in the second stage the head does not mold into the pelvis, even though neither mother nor child should develop urgent signs of distress, the question of delivery must be considered. The classical cesarean section in these cases does not give perfectly satisfactory results, the mortality and morbidity both being higher than at the time of election, even though strict asepsis has been observed throughout labor and rectal examinations have been substituted for vaginal examinations, the more or less exhausted patient being a relatively poor risk for abdominal surgery.

The choice of operation in these cases lies between pubiotomy followed by forceps or version, low cervical section, and craniotomy on a living child. The last named procedure should not be considered, unless the conditions are such as not to warrant the belief that the patient, in the surroundings in which she is placed and with the surgical skill at her command, will have a good chance. If the surrounding conditions warrant major surgery, the choice between pubiotomy and low cervical cesarean section will be made according to the training and personal preferences of the individual operator. In the hands of the average surgeon low cervical section will probably give the best results.

I do not wish to be understood as advocating allowing a patient to go into labor with the idea of performing a pubiotomy as I distinctly prefer a low cervical operation at or near the time of election in all cases; but in cases of the borderline class, with a pelvis whose true conjugate is between 9 and 10 centimeters, and the child of not more than average size, the results of labor will usually be satisfactory, and if all of these patients were delivered abdominally at the

time of election, a great deal of unnecessary surgery would result and much harm might be done. It is only in the occasional case that the fetal head will be so ossified as not to mold deeply enough into the pelvis in this type of patient to permit of extraction from below. Failure of the uterine forces can usually be recognized after a few hours of first stage labor at a time when good results can be expected, if it is decided to resort to abdominal delivery after a moderate test of labor. If, however, the child is above average size, as shown by careful examination, or if the pregnancy has been sufficiently prolonged beyond the expected date to warrant the assumption of overossification of the fetal skull, the pelvic measurements cease to give information of value, and the relative disproportion of the child is an indication for an abdominal delivery before or early in labor. Many children have been lost through close adherence to a policy which insists on pelvic delivery whenever the pelvis is normal, or only slightly contracted. The important factor in these cases is the relation of the individual child to the individual pelvis, plus the other factors that cannot be discovered until a modified test of labor has been applied. If the child is overdeveloped, it furnishes just as strong an indication for cesarean section as if the pelvis is contracted.

If in patients who are submitted to the test of labor progress is not satisfactory, if the cervix does not dilate properly under the pressure of the membranes, or if, the membranes having ruptured prematurely, the head does not descend deeply enough into the pelvis to produce dilatation of the cervix, the test of labor should be abandoned promptly and the patient delivered by cesarean section before exhaustion and possible infection render her an unfavorable risk. If operation is undertaken within a few hours after the beginning of labor, and if the risk of vaginal contamination is slight or absent, the classical operation will prove satisfactory, although I consider the Kerr operation the best procedure in such cases.

Whenever a patient is under consideration, in whom serious doubt exists as to the possibility of pelvic delivery, on account of marked disproportion between the child and the pelvis, the best results will be obtained by the classical section at the time of election. This will result in a few unnecessary operations, since the molding power of the fetal head can only be accurately ascertained by a prolonged test of the second stage of labor, but the benefit to the great majority of patients will more than compensate for this. The same holds true in patients who fall well below the normal standard, whether physically or nervously in whom the strain of even a comparatively easy labor may produce marked after effects.

Patients with marked heart lesions, especially mitral stenosis, or severe aortic lesions, in whom the previous history suggests danger of decompensation during labor, or in whom the effect of labor on the future health of the patient is feared, belong in this group. I feel strongly that in a primipara the strain of labor must be avoided. In multiparae with soft cervixes the indication is less clear, unless sterilization seems advisable, as is the case if the patient has ever had an attack of decompensation. Even a slight test of labor may be productive of permanent invalidism in these patients, who are in the unfit class for labor, and delivery is indicated by cesarean section at the time of election, in order to minimize as far as possible the damage to the heart, which inevitably results from pregnancy and which will be much increased by labor. The classical operation is best suited to these cases, since it is quicker and easier than the extraperitoneal operations, and, therefore, is less likely to cause shock and requires a shorter period of anesthesia, and furthermore allows an opportunity for sterilization if it seems advisable.

In other patients the indication for operative delivery arises from some complication of pregnancy, rather than in some deficiency on the part of the patient which renders her a subject for the easiest possible delivery. Premature separation of the placenta, placenta previa, and severe and increasing toxemia of pregnancy are good examples of this indication.

The time of operation or indication for delivery is determined by the threatening nature of the symptoms. Whenever the symptoms are sufficiently threatening to indicate prompt delivery, no time should be lost and the patient should be delivered as soon as preparations can be made. Unless, however, as may occur in certain cases of hemorrhage, delivery may be called for at the earliest moment possible, the patient should be removed to a well equipped hospital and the operative procedure undertaken with due deliberation, since hasty operation without adequate preparation may result in saving the mother from death by hemorrhage, to lose her from infection.

The choice of method depends on the urgency of the symptoms, i.e., the necessity of avoiding all possible shock, on the condition of the soft parts, on the period of pregnancy which has been reached, and on the surroundings in which the operation must be performed. If the cervix is long and rigid, the canal not obliterated, and the patient near enough to term in placenta previa or eclampsia to warrant hope of a living child, abdominal cesarean section is the operation of choice.

In premature separation of the placenta, although there is little or

no hope for the child, the operation is indicated on the mother's account, since her condition is usually such as to render the avoidance of all possible shock advisable, and experience has proved that postpartum bleeding may in any case render hysterectomy necessary. In a certain proportion of these cases the uterine musculature has undergone almost complete disintegration from the hemorrhage which has taken place into it, and hysterectomy offers the only protection to the mother against death from postpartum hemorrhage. Delivery from below in these cases is too long and difficult a process and attended with too much shock and trauma to be advisable, the patient not being in labor, unless the surroundings of the patient are such as to militate against success if the abdominal route is selected. If, however, in placenta previa the cervix is soft and the canal obliterated, so that the stage of dilatation will be short and attended with little shock, and especially if the child is markedly small and premature, the use of a dilating bag or Braxton-Hicks version after partial dilatation of the cervix will give on the whole more satisfactory results for the mother, while the prematurity of the child renders its prognosis so doubtful that it should not be considered a factor in the choice of operation.

When a patient is first seen in consultation during labor the need for prompt operative delivery is usually suggested by one or more factors: (1) The presenting part is not engaged after several hours of labor, or is only lightly engaged, and is showing no tendency to enter the pelvis further, in spite of strong uterine contractions, which have produced a satisfactory degree of cervical dilatation. Examination, under anesthesia if necessary, in such a case will determine whether serious disproportion exists between the pelvis and the presenting part, and if operative delivery seems indicated, the method best suited for the patient can be selected after a careful consideration of all the factors in the given case.

(2) In spite of good uterine contractions the cervix remains thick and rigid, and is not dilating satisfactorily, while the presenting part is showing no signs of entering the pelvis and signs of exhaustion are beginning to appear. Such a condition shows, either that the uterine forces are insufficient for the task to be accomplished, or else some mechanical condition is present, which prevents the proper application of the forces developed by the contractions. In either case there is little or no chance of spontaneous delivery, and the problem to be settled is what method of operative delivery will prove most satisfactory, both in its immediate and remote results. If conditions are otherwise good, cesarean section in such a case is probably the best operation, but if contra-indications to

this are present, the least dangerous method of pelvic delivery should be selected.

(3) Alteration in the rhythm and character of the labor pains, which from being regular and of good character become irregular and nagging, commonly associated with increasing rigidity of the uterus as a whole and marked tenderness over the lower uterine segment. This sequence suggests uterine exhaustion and calls for prompt attention.

(4) The early appearance of signs of exhaustion developing on the part of the mother or child, which show that there is little hope that the patient can accomplish the rest of labor without help, even though progress has been relatively satisfactory up to this point, and operative delivery by the most conservative method is called for.

(5) The membranes have been ruptured a considerable time, progress is unsatisfactory and the patient's pulse and temperature are beginning to rise. This condition is always suggestive of beginning intra-uterine infection and an abdominal delivery, unless followed by an hysterectomy, is a very unwise procedure.

The possibilities of operation, under these various conditions, vary from dilatation of the cervix, either manually or by the use of a dilating bag, and extraction of the child by forceps or version, to delivery by cesarean section, followed by removal of the uterus in cases in which signs of infection are believed to be present. There is no one method applicable to all cases and the choice of operation depends on the judgment of the surgeon, his familiarity with the various procedures possible, and the conditions under which operation must be performed.

It must be remembered that exhaustion alone, whether uterine or general, has a distinct influence on both the mortality and morbidity of the classical cesarean section, that every vaginal examination which has been made adds to the risk of abdominal interference, and that the less thorough the asepsis the greater the danger. The same holds true, though to a less degree, of the extraperitoneal and low cervical operations. Also, it must be taken into consideration that, if the child is in any but first rate condition, no avoidable risks for the mother are justifiable, and that, even though the child is in good condition, unless the surroundings of the patient are conducive to an aseptic operation and proper after care, cesarean section should not be considered, even though vaginal delivery may involve the death of the child.

In all cases of this sort the patient should be carefully examined under anesthesia, if necessary, the strictest asepsis being observed. The size of the presenting part should be carefully compared with the pelvis, the size of each being carefully estimated. The degree of molding which

the head has already undergone should be considered, and the further degree necessary to enable it to pass the pelvis estimated. The condition of the soft parts should be ascertained, the resistance which they will oppose to delivery estimated, and the condition of both mother and child determined. If the cervix is fully dilated or dilatable, and the head is engaged in the brim, a tentative application of high forceps may be made, to test whether the head can be brought into the pelvis. If the head advances without the use of an undue amount of force, this method should be persisted in and the child delivered. If, however, the tentative traction has no effect, the choice of operation lies between extraperitoneal section, pubiotomy followed by forceps or version, and craniotomy, the method selected being dependent on the condition of the child and the question of uterine infection of the mother. If the child is in any but excellent condition, or if the mother shows signs of infection, pubiotomy is contra-indicated and craniotomy offers the best chance for the mother. It may be that, in a case of this sort, the family may demand cesarean section for religious or other reasons, in spite of the danger to the mother, and in this case either an extraperitoneal section may be performed, if no definite evidences of uterine infection are present, or a supravaginal amputation of the uterus following cesarean section, if such evidences are present. If definite evidences of probable infection are present cesarean section by any method offers so great an increase in the danger to the mother that only the most urgent reasons for obtaining a living child warrant its performance, and even then the dangers must be thoroughly explained to both parents, so that they may have an opportunity to decline the risk.

When examination shows that, in spite of prolonged labor, the presenting part is not engaged and the cervix is still largely undilated and rigid, the choice of operation depends on the estimated disproportion between the head and the pelvis and the condition of mother and child. As a general rule in these cases, when there is marked disproportion between the head and the pelvis, delivery from below will be difficult, both for this reason and on account of the rigid undilated cervix. If both patients are in fair condition and there is no definite evidence of infection, a low cervical cesarean section is the operation of election. If the child is in poor condition, dilatation or incision of the cervix, followed by craniotomy, is the safest procedure for the mother, unless there is evidence of a virulent infection, or the pelvis is extremely contracted, i.e., with a true conjugate of less than $5\frac{1}{2}$ centimeters, or the child is unusually large.

If in such a case there is definite evidence of infection, incision of

the cervix is contra-indicated, and the only operation which offers even a fair prospect of success, in case the cervix is too rigid for manual dilatation, is cesarean section followed by removal of the uterus, and at the best in such a case the prognosis is doubtful, the mortality being in the neighborhood of 20 per cent.

In frankly infected cases the best chance for the mother, when marked disproportion exists between the pelvis and the presenting part, is cesarean section followed by hysterectomy, unless the soft parts are in such a relaxed condition as not to seriously complicate delivery by craniotomy. Craniotomy on an infected patient is not without risk, and from 8 to 10 per cent of these patients die as a result of the infection. In the cases which require a difficult manual dilatation or incision of the cervix, before the craniotomy can be performed, the risk is much greater and abdominal delivery followed by amputation of the uterus is probably safer for the mother and offers the only chance for the child.

It is impossible to consider in detail all the complicating conditions which may enter into the problem, but this brief summary will serve as a general guide to treatment. A routine cesarean section in all late cases of complicated labor will probably prove more fatal to the mother than the routine adoption of any other single method. Many lives are sacrificed yearly because cesarean section is widely adopted as the easiest way of meeting complicated situations, without regard to the fact that the prognosis of the operation grows steadily worse with every hour of active labor to which the patient is subjected, and that every vaginal examination also increases the risk, even though the asepsis is beyond reproach. A thorough study of each individual patient and the adoption of the method of delivery best suited to her needs and the circumstances of the case will do much to improve the results; but as long as the majority of obstetric cases are cared for by men who are not interested in obstetrics and who have not been trained in the care of complicated labor, the results will never be satisfactory, and many mothers and children will be sacrificed unnecessarily. Until the medical profession realizes the importance of prenatal care and is willing to admit that no man can do intelligent obstetrics unless he has taken special training to fit him for the work, the results will continue to fall far short of what they should be. It is also necessary that the attendant should be willing to admit the fact that his ability to perform cesarean section, although his training may not be sufficient for him to know whether cesarean is the best method of delivery for the patient or not, is not a sufficient indication for subjecting the patient to this operation, since otherwise cesarean section is almost as much of a menace to the parturient woman as a benefit.

The low cervical cesarean section promises well in cases in which the classical operation seems a doubtful expedient on account of the dangers of infection. It is not, in my opinion, to be substituted for the classical section in all clean cases, although future experience may demonstrate that it has very definite advantages, except when speed in delivery is indicated for any reason, or when, as in placenta previa, the lower uterine segment is so vascular as to render a low incision inadvisable.

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CHAPTER XV

VAGINAL CESAREAN SECTION

Vaginal Hysterotomy Better Name for Operation—Indications—First Three Months of Pregnancy—Second Three Months—Last Three Months—Technic of Operation—Bibliography.

It is rather unfortunate that the term vaginal cesarean section should have been applied by common usage to the operation which is better known as vaginal hysterotomy, since this misuse of the name cesarean section sometimes causes a certain amount of confusion in regard to the nature of the operation.

True cesarean section predicates the delivery of the child through an incision in the abdominal and uterine walls, and the operation is indicated in patients in whom some condition exists which renders delivery through the pelvis impossible or undesirable for one or both patients.

Vaginal hysterotomy, on the other hand, is an operation by which the cervix and lower segment of the uterus are incised per vaginam sufficiently extensively to remove the resistance of the cervix as a factor in opposing delivery, which must then be accomplished by further operative means, i.e., by forceps, version, or craniotomy, according to the indications in the given case. The abdominal cavity is not opened in this operation, except by mistake, and it is simply a procedure to secure sufficient cervical dilatation to permit delivery, which must be accomplished by some other operative procedure.

The use of the term cesarean section, even though qualified as vaginal, leads to the erroneous supposition that the two operations may be used interchangeably, whereas they are employed in entirely different classes of patients for different reasons, and the fact that one of them may be indicated in a given case practically means that the other is not a proper procedure under the conditions which are present, each possessing certain advantages under certain circumstances which renders it the preferable operation for the individual patient.

Indications for Vaginal Hysterotomy.—Incision of the cervix, rather than dilatation, may properly be employed in any case in which the necessity for delivery is urgent and the cervix is too rigid to permit of rapid manual or instrumental dilatation without danger of serious in-

jury to the soft parts, or when the attempt to induce labor by the use of bougies or dilating bags has been made and proved a failure and the symptoms preclude further delay. It is not an operation of election in patients in whom the cervical canal is obliterated and the margins of the external os are not rigid, since in these cases manual dilatation is ordinarily a preferable procedure; and it should never be undertaken in patients who are supposed to be infected, since in these cases the results are extremely bad, owing to the fact that the extensive wound surfaces produced in the operation are sure to become infected, exposing the patient to the exhaustion of a prolonged septic process, and, in case of a virulent organism, to probable death from the increased absorption.

In early pregnancy vaginal hysterotomy is particularly adapted for use in cases in which abortion is urgently indicated and the cervix is entirely unprepared and rigid. This will be found particularly true in patients with serious heart lesions who must be aborted to save their lives, and in patients who are bleeding to a dangerous degree and in whom the rigid cervix renders a rapid dilatation impossible. In these cases the trauma which results from attempts to dilate the cervix and from the prolonged anesthesia often necessary may prove the final factor in causing the death of the patient, whereas, rapid incision of the cervix and emptying of the uterus may give the patient a chance for recovery.

The operation is, as a rule, more likely to be necessary in primiparae, especially in women with long conical cervices, the dilatation of which may prove extremely difficult and prolonged, and in whom the use of the dilating bag is apt to prove unsatisfactory, however valuable it may prove at times in multiparae, and in women in whom the cervix is rigid on account of scar tissue resulting from laceration, operative procedures, or previous inflammations. It is an operation which is ordinarily easy in properly selected cases, but it is not suited to the untrained surgeon, since not infrequently it is an operation which will thoroughly test the skill of the most expert surgeon, especially if attempted on unfit cases.

It may be called for in early pregnancy in cases of pernicious vomiting, in which the cervix is rigid and the condition of the patient demands the most conservative method of emptying the uterus, i.e., the method which shall produce the least shock and the shortest period of anesthesia. If the cervix is at all rigid, vaginal hysterotomy is the best method of securing rapidly the necessary degree of dilatation to permit of thorough emptying of the uterus. The same holds true for other conditions which call for a prompt termination of pregnancy in the early months, such as cardiac lesions with beginning failure of compensation, or inevitable

abortion associated with profuse hemorrhage in a patient with a rigid cervix.

Cervical dilatation by the ordinary methods in cases of this type is a long drawn out process, and it is often impossible to obtain sufficient dilatation by them to permit the passage of the finger into the uterus to remove the ovum, and in cases in which a rapid evacuation of the uterine contents with the least possible shock is advisable, vaginal hysterotomy may prove a life saving operation.

During the middle three months of pregnancy the indications for vaginal cesarean section are practically the same as in the early months. Any condition calling for prompt delivery in a patient with a long rigid cervix will be more successfully treated by this operation than by a prolonged difficult dilatation with its inevitable trauma. The only operation which comes into conflict with it under these conditions is abdominal hysterotomy followed by sterilization in patients who present a permanent contra-indication to pregnancy and labor, such as severe heart lesions or chronic nephritis. Since repeated abortion is not to be considered in such cases, an operation which will render a patient sterile as well as save her life at the same time is to be preferred to an operation which simply ends the pregnancy, if the condition of the patient is such as to render a laparotomy justifiable.

During the last three months of pregnancy prompt delivery may be called for at any time on account of various conditions, especially severe toxemia which does not yield to treatment, placenta previa, premature separation of placenta, or cardiac complications with failing compensation. Induction of labor by means of a dilating bag or abdominal cesarean section will ordinarily prove to be the best methods of terminating pregnancy in the majority of such cases, the choice depending on the estimated rigidity of the cervix, the urgency of the symptoms, and the size of the child. As a general rule in patients near term, in whom the cervix is long and rigid, abdominal section will give the best results for both patients, but if the cervix is apparently of normal consistency, if the child is markedly premature, and if the symptoms are not immediately urgent, the use of the dilating bag will prove the more satisfactory. If, however, the symptoms are too urgent to permit the use of a bag on account of the delay involved in this method of inducing labor, or the child is more than six weeks premature and the cervix is rigid, vaginal hysterotomy becomes the operation of choice. It is also to be preferred to abdominal delivery in cases in which the bag has been employed and found ineffective, since the danger of infection, if the patient is delivered through the abdomen after the intra-uterine manipulation necessary to

the employment of a bag, is so great as to practically contra-indicate the abdominal operation, unless it is followed by hysterectomy, and in these cases vaginal hysterotomy, even at or near term, becomes the operation of election for the trained surgeon; although if infection of the uterus has taken place, the results will not be satisfactory, and no cutting operation is advisable, if other means of accomplishing delivery are possible.

The operation becomes more difficult the nearer to term the patient, and I prefer not to undertake it in the last four to six weeks of pregnancy, if it can be avoided. Previous to that time, especially before the child is viable, the use of a bag, even in cases with fairly marked rigidity, and vaginal cesarean section in case the bag fails to produce satisfactory dilatation, are preferable to an abdominal delivery. If, however, the symptoms are too urgent to permit of the necessary delay appertaining to the use of a bag, the choice must lie between vaginal and abdominal cesarean section, the former being preferable up to six weeks before term, and the latter in the last month of pregnancy. The two weeks not covered are debatable ground, and either operation may properly be performed, according to the judgment of the individual operator and the conditions present in the individual case.

Technic of Operation. The operation of vaginal hysterotomy was first described by Dührsen in 1896 as a better procedure than the division of the cervix by means of the Bossi or other metal dilator, or the difficult manual dilatation of a rigid undilated cervix, and it is not too much to say that time has justified Dührsen's claims. The vagina is prepared as usual for operation and the rectum and bladder are emptied. Full anesthesia is necessary for a successful operation. A heavy traction suture is then introduced through either side of the cervix which is drawn down as close as possible to or even outside the vulva, or, if preferred, the traction may be made by seizing either side of the cervix with a French hook, though this method is more likely to damage the cervical tissues severely. If the cervix cannot be brought down to the vulva, the difficulties of operation are much increased. A longitudinal incision is then made through the anterior vaginal wall from a little above the urethra to the external os (Fig. 48). The bladder is then separated from the anterior surface of the cervix and lower uterine segment by blunt dissection, preferably with the gloved finger covered by a piece of gauze, at first by touch alone; but later a large retractor is introduced into the wound and the separation is completed under the guidance of the eye. The bladder is drawn up behind the retractor, thus exposing the whole anterior wall of the uterus from the anterior lip of the cervix to the contraction ring. With a pair of heavy, straight scissors, a median in-

cision is now made about 10 centimeters long, extending from the margin of the external os to practically the level of the contraction ring. The speculum is removed, one hand is introduced into the uterus, the membranes are ruptured, and the child turned and extracted. If the child is dead or non-viable, it is a wise precaution to perforate the head and

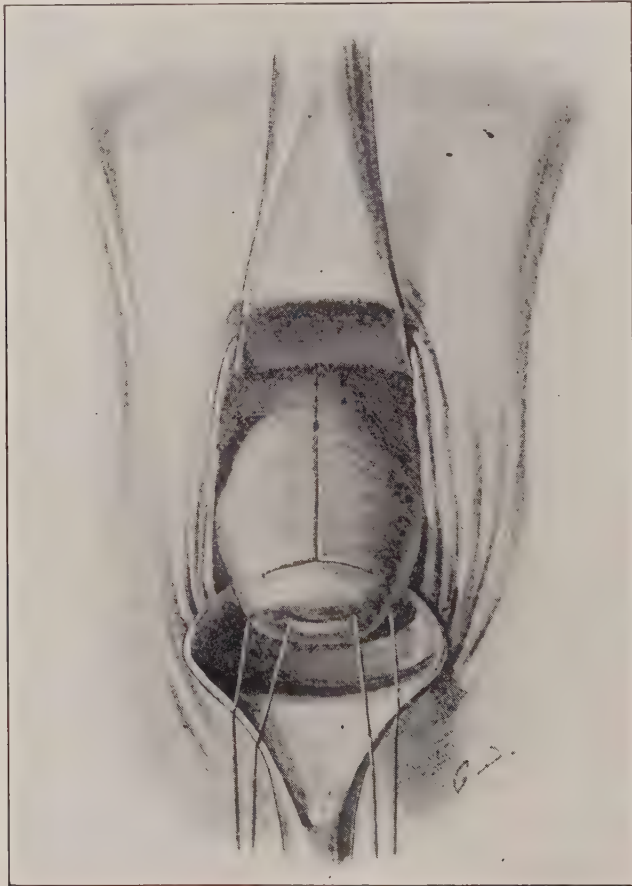


FIG. 48.—VAGINAL HYSTEROTOMY.

(From a Manual of Midwifery by Henry Jellett, published by Balliere, Tindall & Cox, London.)

thus render extraction of the after coming head more easy, since the smaller the head the less the liability of damage to the uterus in case the incision is too short. The placenta is extracted manually and the operation is completed by suturing the wound.

Traction on the sutures introduced at the commencement of the operation, or on the French hooks, will now bring the whole uterine incision into view as a triangular opening, and it is readily closed from above downward by interrupted sutures of chromic catgut, which are intro-

duced, under the guidance of the eye, care being taken to place the uppermost stitch just above the upper angle of the wound. The incision in the vaginal mucosa is then closed by a continuous catgut suture. Some operators prefer to introduce a small rubber drain into the dead space which always remains between the bladder and the vaginal mucous mem-

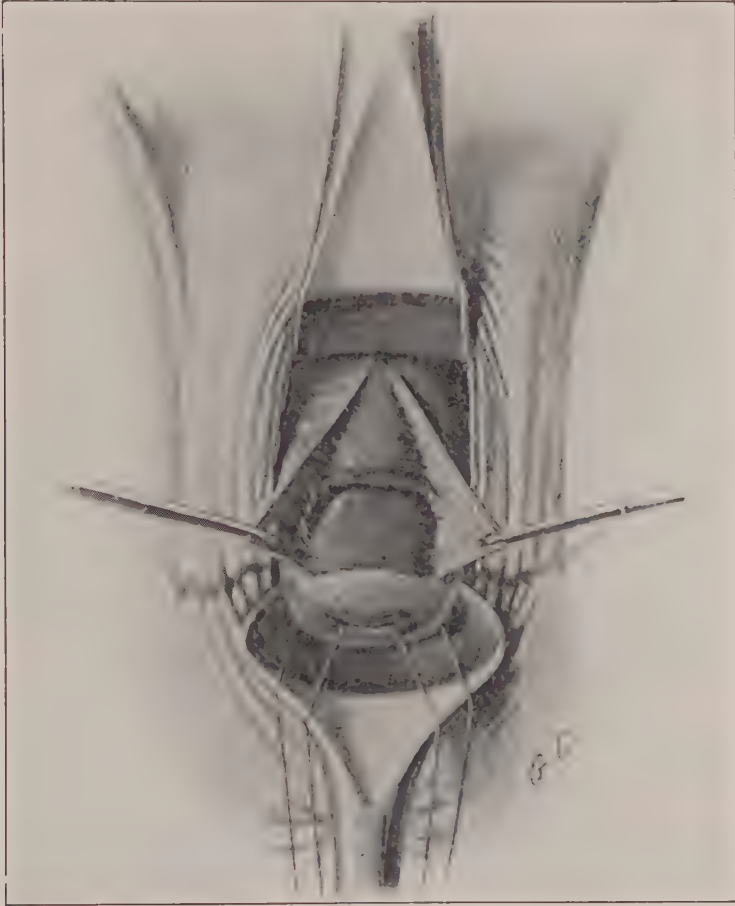


FIG. 49.—VAGINAL HYSTEROTOMY.

(From a Manual of Midwifery by Henry Jellett, published by Balliere, Tindall & Cox, London.)

brane, to prevent the formation of an hematoma, which may become infected and cause symptoms. This is usually unnecessary, however, unless there is free venous bleeding present and it is not possible to find and ligate the bleeding vessels.

This anterior incision affords sufficient space for the extraction of an average sized child up to the eighth month of pregnancy, but after that time, or in case of an unusually large child, a posterior incision should also be made. In this case the operation is begun by a transverse incision

to, but not through, the peritoneum, in the posterior fornix at the cervical junction, the peritoneum being peeled off from the cervix and lower uterine segment, which is then incised in the middle line for a distance of 5 centimeters, after which the anterior incision is made as described. This posterior incision is necessary in cases operated on near term to

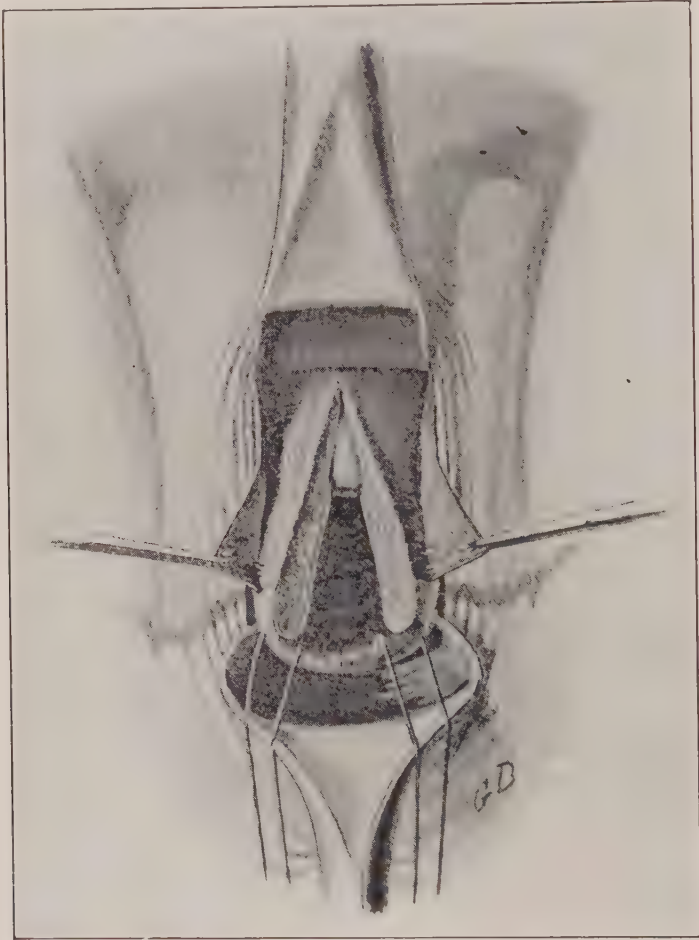


FIG. 50.—VAGINAL HYSTEROTOMY.

(From a Manual of Midwifery by Henry Jellett, published by Balliere, Tindall & Cox, London.)

allow room for the passage of the full term head, the smallest circumference of which is 32 centimeters. Otherwise an anterior incision of 15 or 16 centimeters would be necessary to permit passage of the head without such tearing at the upper end of the incision as would open the peritoneal cavity. With the double incision neither need be so long. The posterior incision is closed first and then the anterior, as described above.

In the hands of a trained operator this operation permits delivery of

the child in a few minutes and the whole operation can be completed in thirty minutes or less. Aside from the rapidity with which the operation can be performed and the consequent reduction of shock, it possesses definite advantages over instrumental or manual dilatation, in that it leaves a clean cut wound properly united by sutures, instead of a deep

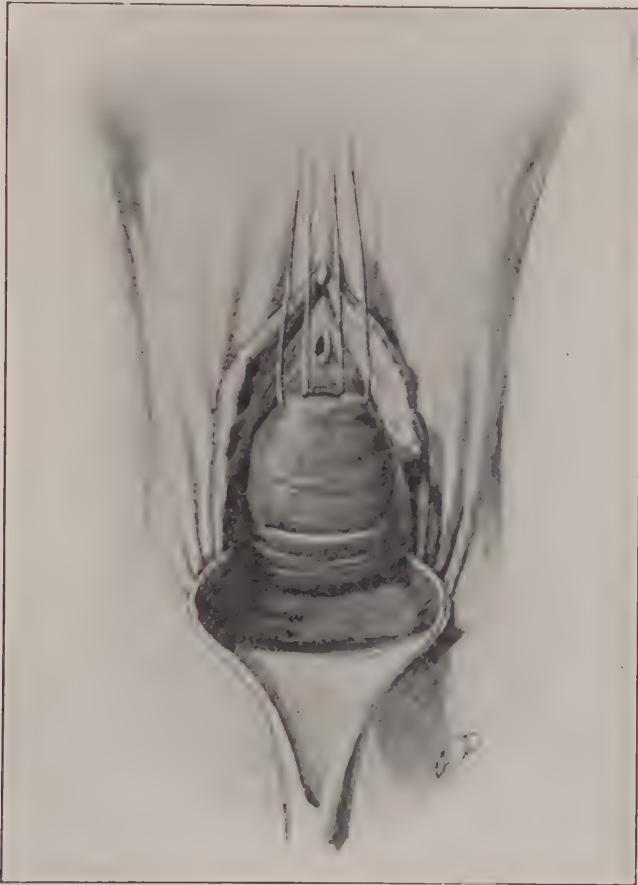


FIG. 51.—VAGINAL HYSTEROTOMY.

(From a Manual of Midwifery by Henry Jellett, published by Balliere, Tindall & Cox, London.)

irregular cervical laceration, often extending into the lower uterine segment, which it may prove impossible to repair properly. If the incision is carefully made in the median line the amount of hemorrhage is usually very slight, but if the incision deviates to either side hemorrhage may be severe.

The ease of operation is distinctly compromised, if the speculum employed is too small to give a proper view of the field of operation, or if the incision is too short or not in the midline of the uterus. In the latter

case the hemorrhage may be profuse, owing either to laceration at the upper angle of the incision during extraction of the head, or to injury of the large vessels which lie at the sides.

There is a distinct tendency to relaxation of the uterus and post-partum hemorrhage after the operation, and it is distinctly a wise pre-

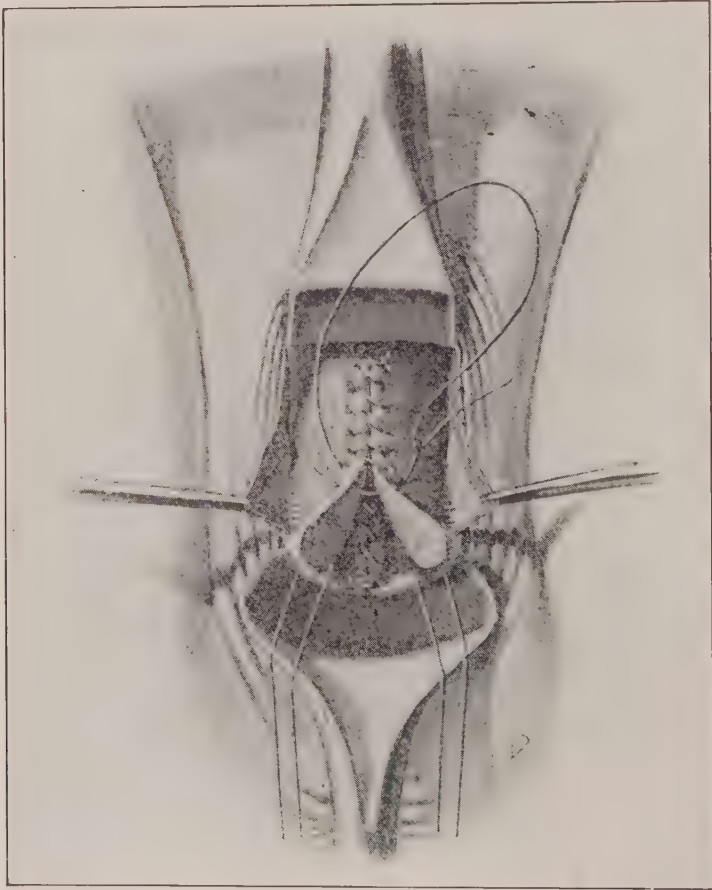


FIG. 52.—VAGINAL HYSTEROTOMY.

(From a Manual of Midwifery by Henry Jellett, published by Balliere, Tindall & Cox, London.)

caution to pack the uterus before suturing the anterior wall, although in many cases it is unnecessary.

Dührssen's suggestion that the operation could be made more simple and easy by introducing a medium size dilating bag into the uterus, which is filled with sterile saline solution and used as a tractor, is of some value in difficult cases. This acts as a guide to the length of the incision necessary for the delivery of the child's head, the anterior wall of the lower

uterine segment being incised until the bag slips out, thus minimizing the risk of attempting to deliver through too small an opening.

One of the greatest difficulties in the operation lies in the fact that, in occasional case, it is impossible to bring the cervix to the vulva, and if the vagina is narrow and rigid, this may render the operation very difficult,

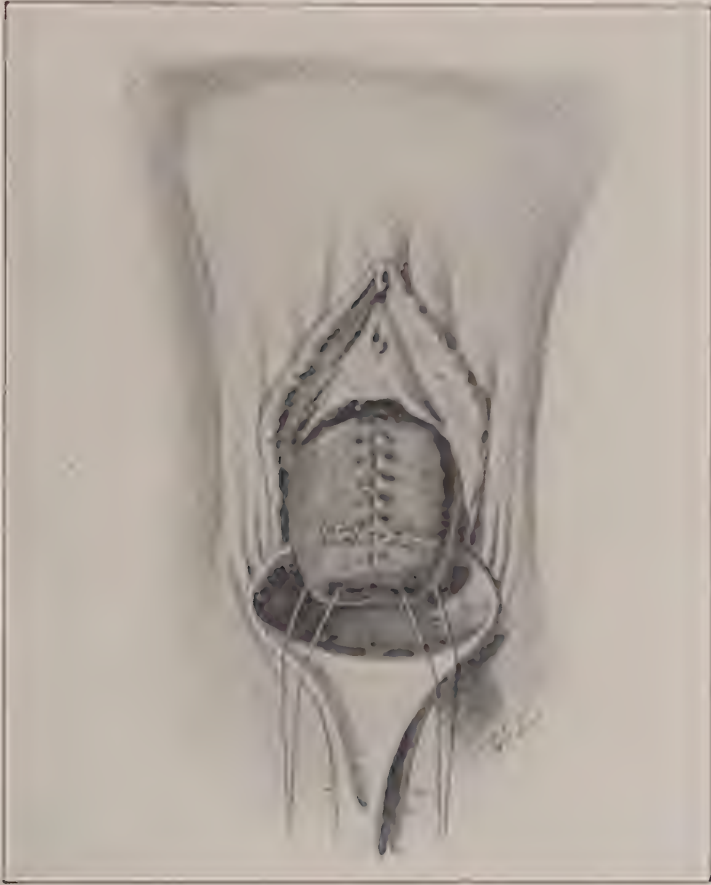


FIG. 53.—VAGINAL HYSTEROTOMY.

(From a Manual of Midwifery by Henry Jellett, published by Balliere, Tindall & Cox, London.)

and in some cases the perineum must be incised to facilitate the operation. Ordinarily, however, it is a simple operation for the trained surgeon, the great difficulty in private practice being that it requires the help of two assistants besides the anesthetist, as well as a good light. It is, therefore, not well fitted for use by the general practitioner of little or no surgical experience, who often has to operate without trained assistants in emergency cases, as was recommended by Peterson a few years ago; and furthermore, its success depends on the maintenance of thorough surgi-

cal asepsis. It is distinctly a hospital operation for a trained surgeon, to be undertaken only on patients believed to be uninfected.

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CHAPTER XVI

SUPPLEMENT

Transperitoneal Low Cervical Cesarean Section.—Since the publication of the first edition, increased experience with the transperitoneal low cervical operations leads to the conclusion that they have some advantages over the classical cesarean section in both clean and doubtful cases, except when the placenta lies in the lower uterine segment, when extensive adhesions block off the pelvic cavity, or when the lower uterine segment contains one or more fibroids of considerable size. When compared with true extraperitoneal operations the advantages of the low cervical operations are still more marked.

There are two modifications of this type of operation, known as the Beck and the Kerr operations, differing principally in the fact that in the Beck operation a longitudinal incision is made in the lower uterine segment and upper cervix, whereas in the Kerr operation a semilunar transverse incision is made in the lower uterine segment with the convexity downward. In the light of a limited experience with the Kerr operation I prefer it to the Beck, but have not had as yet sufficient opportunity to follow patients in repeated pregnancies to speak with authority. Both operations must be described in any monograph on cesarean section that is to be considered complete.

Beck's Operation.—The abdomen is opened in the middle line by an incision extending from a point just below the umbilicus to the symphysis pubis. The attachment of the peritoneum in the region of the bladder reflection will always be found somewhat loose, and, if the patient has been in labor for any considerable time, markedly so. The loose peritoneum is incised transversely just above the bladder reflection well out toward the round ligaments on either side. Early in labor there may be some difficulty in exposing this area, but this is easily overcome by the use of a moderate Trendelenburg posture. Late in labor this is seldom necessary. The peritoneum and the bladder are dissected off the anterior surface of the lower uterine segment and upper cervix as in supravaginal hysterectomy. If a double flap is desired in order to secure more perfect protection against leakage from the uterine wound in doubtful risks, the peritoneum on the upper side of the incision is then care-

fully dissected from its uterine attachment. This is best done by passing a pair of closed scissors under the peritoneum in the line of cleavage. They are then opened and withdrawn, freeing the peritoneum from the underlying tissues. By repeating this several times on each side a good peritoneal flap is obtained. The two peritoneal flaps are then held back by retractors and the lower segment of the uterus and upper portion of the cervix are exposed. Considerable hemorrhage may occur at this time which is usually easily controlled by gauze packs.

Inasmuch as the early cases whom we delivered by the low cervical method were doubtful risks we adopted the precaution of walling off the general peritoneal cavity by gauze packs to prevent contamination when the uterus is opened. The results of this precaution have proved so satisfactory that we have continued its use in clean cases although it is not essential in them.

The uterus is opened by a small incision in the midline of the lower segment which is lengthened by means of scissors downwards into the upper cervix and upwards to the edge of the thickened fundus. The bladder is carefully held out of the way by a retractor so that injury of it is impossible. One hand is then passed into the uterine cavity, a finger is inserted into the mouth of the child, and the face is rotated anteriorly and held in the wound. Forceps are then applied to the sides of the head and delivery is accomplished as in a face presentation.

Before attempting to remove the placenta and membranes a deep traction suture is passed through the wall of the cervix just below the lower angle of the wound. This will prevent retraction of the lower angle of the wound into the pelvis and facilitate closure, as well as make it easier to control any bleeding in the depths of the wound which occasionally is very troublesome and is perhaps the greatest objection to this operation. A similar traction suture is placed just above the upper angle of the wound. Traction on these sutures holds the wound in a proper position for suture and also tends to limit spill into the peritoneal cavity.

The placenta and membranes are then removed manually or expressed through the cervix into the vagina. An ampul of pituitrin is then injected into the wall of the uterus or into one of the veins of the broad ligament. The uterine wound is closed by two layers of chromic catgut sutures. The first layer consists of a continuous suture, including the whole musculature to but not through the endometrium, beginning at the upper and ending at the lower angle of the wound, especial pains being taken to close each angle. The second layer should be of interrupted sutures placed at short intervals, including the upper half of the

musculature. The traction sutures are then tied, thus bringing together any fibers which may have been torn beyond the line of suture. The sutures are then cut, allowing the lower portion of the wound to drop into the pelvis.

If an upper peritoneal flap has been dissected it is now brought down over the upper part of the uterine incision and fastened by several interrupted catgut sutures, care being taken that they do not enter the uterine cavity. The bladder reflection is then carried up so that its upper margin overlaps the lower edge of the upper peritoneal flap by at least one centimeter and sutured securely in place by superficial catgut sutures, and the abdominal wound is closed in layers.

Kerr Operation.—In this operation, which we prefer to the one just described, the preliminary steps are exactly the same. Instead of opening the uterus by a longitudinal incision, however, the lower segment is opened by a curved transverse incision, the concavity of which is downward, which runs well out toward the lateral margins of the uterus on either side. The child and placenta are extracted as described above and the wound is sutured in two layers and covered by the peritoneal flaps as in the Beck operation.

Occasionally a large sinus is opened in making this incision and free bleeding occurs which stops at once when the child is extracted. The whole field of operation is within easy reach with the patient in the Trendelenburg position, which is not always the case with the longitudinal incision. Our experience with this operation is still too limited for us to speak with authority as to the results of repeated cesareans by this method but it seems very promising.

When these operations are performed on doubtful risks the convalescence is by no means ideal, but I am inclined to believe that it is more comfortable for the patient than after a classical section on similar cases, and the mortality is undoubtedly lessened. I do not consider either of these operations indicated in cases of definite infection with a virulent organism.

CHAPTER XVII

SUPPLEMENTARY CONTRIBUTION

BY LOUIS E. PHANEUF, PHM.D., PH.C., M.D., F.A.C.S.

The literature on cesarean section has been reviewed from 1921 to date. A great many papers on this subject have been published during this period. There was considerable repetition. Only what were thought to be the most important articles could be reviewed in the space allotted to this chapter.

The review on cesarean section will be taken up under the following headings:

1. Indications
2. Classical cesarean section
3. Mortality in cesarean section
4. The uterine scar and rupture of the uterus after cesarean section
5. Cesarean section under spinal anesthesia
6. Cesarean section under local anesthesia
7. Porro's cesarean section, or cesarean section followed by hysterectomy
8. Cesarean section followed by temporary exteriorization of the uterus
9. Cervical cesarean section
 - (a) Longitudinal incision
 - (b) Transverse incision
10. Vaginal cesarean section

Indications.—The indications for cesarean section have become rather more complex than those given by Murphy when writing on the subject in 1862. He gave the following reasons why the operation should be performed:

1. In the ovate deformity of the pelvis, when the conjugate axis is less than 2 inches.
2. In the cordiform distortion from mollities ossium when the distortion is extreme and craniotomy is either impracticable or so difficult that the safety of the mother cannot be secured.
3. When tumors are immovable, or so occupy the pelvic cavity as to leave space of only 2 inches between the tumor and the pelvis.

The tendency of the last few years has been to limit rather than to increase the indications of cesarean section. Obstetricians are realizing more and more that cesarean section is not a panacea for all obstetric ills.

Burnell¹ stated that during his service as Resident Obstetrician and Gynecologist in the Long Island College Hospital, Brooklyn, over 100 cesarean sections were performed. The gross indications were as follows: Placenta prævia, 4; obstruction from pelvic tumors, 6; decompensated cardiac cases, 6; eclampsia, 6; malposition of the fetus (posterior face and transverse), 11; malformations of the uterus, 3; primiparæ with contracted pelvis, 32; multiparæ with contracted pelvis, 17; postoperative dystocia, 9; previous cesarean section, 6. He takes up in detail each of the indications in the series reported.

Davidson² wrote that before undertaking cesarean section for a relative indication certain conditions should be present to insure a successful outcome:

1. The child should be alive and in good condition.
2. The patient must be in good condition physically, not exhausted by long labor, not infected by previous vaginal examinations or previous attempts at delivery.
3. She must be in a hospital or equally good surroundings for a major operation.

As *pelvic conditions* he mentions kyphosis of the spine, coxalgic pelvis, transversely contracted pelvis, pelvic exostoses, osteomalacic pelvis, tumors of the pelvis and old fractures of the pelvis.

Among the non-pelvic indications for cesarean section the following are cited: Fibroids, cancer of the cervix, ovarian tumors, rarely abdominal tumors or tumors of the vagina. Atresia of the vagina may become an absolute indication. A previous complete tear through the rectum which has been primarily or secondarily repaired frequently becomes a relative indication for cesarean section.

He raises the question of "once a cesarean section, always a cesarean section," and states that Barton Cooke Hirst, at the Southern Association meeting in November, 1924, answered this question to his own satisfaction by stating that when he has performed an operation himself, he has no fear in letting the woman deliver herself subsequently, if there is no other contra-indication. If there has been evidence of infection following the operation, or if great care has not been taken in suturing the uterus, it is safer to do another cesarean rather than run the risk of ruptured uterus.

Eclampsia is mentioned to say that the mortality has been so great that the conservative methods of treatment are considered by the majority to be the safer.

Placenta prævia of the marginal type is not an indication for cesarean section, and is better treated by doing a version, but placenta prævia centralis, especially in a primipara at or near term, is now considered by many an absolute indication for cesarean section.

Premature separation of the normally situated placenta, mitral stenosis, aortic valvular lesions and myocarditis render pregnancy and labor very dangerous, and abdominal delivery before the onset of labor offers a better prognosis in a number of cases.

Donovan³ considers, besides the above-named indications, chronic nephritis, septic condition of the genital region, uterine inertia and breech presentation in primiparæ. These are open for discussion, and many operators would not subscribe to them, especially breech presentation in a primipara. In the absence of a pelvic contraction or of marked disproportion a breech delivery through the parturient canal is not a very difficult procedure, and most breech cases are still delivered that way.

About exophthalmic goiter Donovan continues: "Much the same reasoning and indications apply in exophthalmic goiter as in diseases of the heart, but there is an added toxic element. The patients do not tolerate the anesthesia well, but stand the strain of labor still less well. The only two patients for whom I have performed cesarean section on account of this condition, in both it was very severe, stood the anesthesia well. As showing the effect of labor in the condition the pulse rate of one of these patients rose twenty beats in the first two hours of labor. I look upon exophthalmic goiter in late pregnancy as a positive indication for cesarean section. The time at which it should be performed depends on the result of absolute rest in bed. If the patient improves, operation should be postponed to near calculated term in order to increase the chances of the child."

Ballantyne^{4, 5} reviewed the literature for the years 1918, 1919, 1920, with a few references to 1917 and 1921 cases. He reviewed the literature on placenta prævia and felt that cesarean section is likely to be chosen in only a few cases of placenta prævia, and that especially of the central variety in primiparæ. He realizes that without cervical dilatation it is not always possible to determine the central position of the placental insertion. When cesarean has to be decided upon, "whatever be the sphere of its usefulness in the future, there can be no doubt that in many quarters at the present time there are signs of a revolt against the practice of so often sacrificing babies by making these babies plugs to save their mothers' lives."

In his series of cesarean sections in recent years, he has operated once for placenta prævia with a successful result, in a second case the circumstances were favorable but a chance prevented him doing so, and since the fetus turned out to be anencephalic, there was no room left for regret.

Accidental Hemorrhage.—Ballantyne feels that the field of cesarean section in cases of accidental hemorrhage is even more restricted than that in placenta prævia. This opinion is not entirely in accord with that of American operators, for the reviewer has gathered the impression from the papers written in the last seven years that accidental hemorrhage, at least in the United States, is gaining ground as an indication for abdominal delivery.

Eclampsia he summarizes as follows: "Notwithstanding some marked exceptions, the general tendency at the present time is to pass away from the cesarean section as the ideal treatment for eclampsia, and, should adequate supervision of pregnancy and medical measures in the pre-eclamptic state prove useful, the tendency will become still more marked up to the degree of abandonment. Much depends, of course, on the discovery of the real cause of eclampsia, should it be established that it is something formed in the fetus

or placenta, the arguments for the rapid emptying of the uterus will be reinforced and cesarean section and other operative measures will again come to the front." He has not done a section either for preëclamptic state or for eclampsia, for he holds firmly to the dictum that the fits and the toxemia should be treated and the pregnancy left alone.

Rare Indications for Cesarean Section.—He discusses pelvic causes as pelvic contraction and deformity. Among the non-pelvic causes he mentions placenta prævia, accidental hemorrhage, and eclampsia as having already been discussed. In addition, heart disease, ventral fixation, neglected transverse presentation, face cases, occipitoposterior positions, breech presentation in the elderly primipara, ovarian cysts, fibroids, atresia of the cervix, malignant cysts, growths of the uterus and neighborhood, and states that these indications must be regarded as extremely rare.

Uterus, didelphys, contracted pelvis, double uterus, and multiple fibroids, hydramnion, ascites, and an ovarian cyst with a twisted pedicle wedged into the pouch of Douglas, peritonitis situated around the vermiform appendix, retention of the fetal head after decapitation, vaginal varicose veins, previous large infants have been collected in the literature by Ballantyne as rare indications.

Greenhill^{6, 7} performed cesarean section, "laparotrachelotomy," in a primipara 26 years old for enormous edema of the vulva in the presence of a very large child.

The dystrophia dystocia syndrome as an indication for cesarean section is taken up by Greenhill. He gives 6 case reports, all patients having been delivered by the transperitoneal cervical cesarean section, and one case showing the bad results of so-called conservative treatment.

Under this syndrome Greenhill included gravidæ revealing certain masculine characteristics, or evidence of hyperpituitarism. There may be a wide distribution of hair, a masculine form of face and extremities, and a masculine pelvis with thick heavy bones and narrow pubic arch. In general the pelvis is slightly contracted. Most of the women are rather short and stout. They have short forearms and short stubby fingers, but large wrists and ankles. Most of them go over term. At the time of labor the pains are generally weak and irregular and may last for days without any progress being noted. The vertex usually presents as a posterior occiput and it remains high in the pelvis. Not infrequently the breech is the presenting part. The membranes often rupture early in labor and the cervix dilates very slowly. These patients frequently have only one pregnancy, and it is important that a live baby be delivered, especially because the added risk of cesarean to the mother is slight.

Kerr,⁸ in a paper entitled "Indications for Cesarean Section," took up the following: Contracted pelvis, fibromyomata, ovarian cystomata and other tumors, such as broad ligament cysts, malignant ovarian tumors, tumors of the pelvis, tumors of the pelvic colon and rectum, and carcinomata of the cervix. In eclampsia he states that "the causes suitable for cesarean section are those in which the pregnancy is well advanced but in which there is no dilatation of the cervix or attempt at labor, and where after six hours, there is no improve-

ment from blood letting, intravenous saline infusion and morphine. Where the seizures occur earlier in pregnancy than the thirty-second or thirty-third week vaginal cesarean section is preferable."

Placenta prævia, accidental hemorrhage, ventrofixed uterus, interposition of the uterus, prolapse of the cord, impacted shoulder presentation, abnormal conditions in the child, retraction and contraction rings, rigidity of the cervix and vagina, and grave diseases threatening the life of the mother are discussed from the standpoint of indications.

Liepman⁹ reported a case in which vulval eczema and placenta prævia were the indications for cesarean section. Intraperitoneal cervical cesarean section was performed. The mother and child were discharged well.

Dougal^{10, 11} performed cesarean section for labor obstructed by the non-gravid horn of a double uterus in a woman of 33, a primigravida, two days after commencement of labor pains, which were weak and infrequent. The child presented by the breech, but the lie was rather oblique and a soft mass could be felt lying at the brim of the pelvis on the left side and displacing the presenting part. No progress was made in twenty-four hours. Cesarean section was done with a living child. Pregnancy had occurred in the right horn of a uterus bicornis unicollis, and the left horn, enlarged to the size of a three months pregnancy, lay at the level of the pelvic brim. Good recoveries.

Dougal also did a cesarean section for adhesions between the anterior uterine and abdominal walls obstructing labor and following an abdominal myomectomy.

Guy¹² performed cesarean section for pregnancy in a double uterus.

Johnstone^{13, 14} for thoracopagus twins in one case and for advanced rectal cancer in another.

Taylor,¹⁵ in a paper entitled "Cesarean Section, with Special Reference to Present Day Indications for Operation," reviewed all the indications given above.

Paton¹⁶ reported a case of cesarean section for prolapsed cord. Pfeiffer²⁶ had to do a cesarean section following the Coffey plication of the round and broad ligaments. Phillips¹⁷ reported 2 cases of cesarean section for pregnancy in a uterus bicornis unicollis; Shaw¹⁸ for a slightly contracted pelvis combined with rectovaginal fistula; White¹⁹ for double lobar pneumonia, one under spinal anesthesia, in which the mother and child recovered, and another for osteoma of the broad ligament; and Whitehouse²⁰ for sacculation of the uterus.

Rivière²¹ reported 4 classical cesarean sections for what he terms unusual indications:

1. In the first, the indication was prolapse of the cord in a secundipara, before dilatation and in the presence of a slightly contracted pelvis.
2. In the second case, the indication was adherent retroflexed uterus at term. This operation was followed by hysterectomy.
3. In the third, the indication was intestinal obstruction of paralytic origin in a primipara at term.

4. In the fourth case, the indication was non-neoplastic rigidity of the cervix in a primipara.

Léon Valois ²² reported a cesarean section on a secundigravida, 28, for prolapse of the cord, without dilatation.

Laffont and Jahier ²³ reported a cesarean section where a uterus infraseptus unicorporeus was the indication.

Siegel ²⁴ asked the question whether the surgeon is justified in performing prophylactic cesarean section in the interest of the child in cases in which there is 80 per cent of probability of normal delivery through a moderately contracted pelvis. As arguments against the practice, he mentions the following:

1. Even though the mortality rate has been greatly reduced, it still does exist and will never be zero.
2. The morbidity of cesarean section is higher than that of natural delivery even with forceps, version, perforations, etc.
3. What will be the effect on later deliveries?

In answer to this last question Siegel gives statistics from his clinic. These apply to 113 women on whom first cesarean section was performed, and whose cases were followed up for a number of years (average six years). Of the 113, 59 became victims of secondary sterility, 28 had normal later deliveries, and in 26 cesarean section had to be repeated. Two became pregnant a third time, one was delivered spontaneously, the other by cesarean section. In contracted pelvis, even of first and second degree, there is a probability of 2 to 3 that in the next pregnancy cesarean section will again be necessary, and it is almost certain that it will be necessary in the third, but maternal mortality increases from 4.2 per cent in the first section to 11 per cent in the second and to 28 per cent in the third section or delivery, as the case may be. To excuse this relatively high maternal mortality some authors point out the number of infants saved to society by this procedure, but Siegel says they do not take into account the loss due to secondary sterility caused by this operation. For these reasons he thinks that indications for cesarean section should be very carefully determined and reduced to a minimum. There are cases in which it is unavoidable, such cases for instance as women with pelvic contraction of first or second degree who have passed a certain age, whose soft parts are rigid, who have been sterile for a number of years, and in whom the possibility of later conception is very slight. Likewise in multiparæ who have had a number of stillbirths, or other unfortunate deliveries (but here the obstetrician must not rely merely upon the statement of the patient, which might be highly subjective, but should get in touch with the physician who attended her at the time of such previous deliveries, and ascertain, if possible, the causes responsible for the difficulties).

Zanetti ²⁵ in the discussions on the treatment of placenta prævia, in the Twenty-Second Congress of the Italian Society of Obstetrics and Gynecology (1923), stated that it appeared that cesarean section was acquiring greater importance. He wrote that, in 1924, Viana collected 191 cases of placenta

prævia treated by cesarean section in various Italian clinics. In 75 per cent there was central placenta prævia. The total mortality was 11.4 per cent for the mothers and 23.2 per cent for the infants. Zanetti reported a case with grave anemia. The child was dead previous to the intervention. Postoperative course of the mother was normal. Other interventions, such as penetration of the placenta, are excluded because of the danger of loss of blood in such cases.

CLASSICAL CESAREAN SECTION

In the review of the literature of the last seven years, no great contribution has been made about the classical operation, except for the fact that many operators have found it unsatisfactory in comparison with the low cervical cesarean, and it is slowly but gradually being replaced by the latter method. The discussion about the classical type of operation centers largely on the question of abdominal incision. In this, there is nothing new as this discussion has been going on for years. Some are in favor of the low incision between the symphysis and umbilicus as recommended by Newell. Others advise the high incision above the umbilicus, introduced by Asa B. Davis, while still others advocate the right or left incision using the umbilicus as a mid-point. The question of uterine suture is taken up in almost all of the papers read. Here again, catgut, linen and silk find their supporters, some using a non-absorbable suture such as linen or silk in the muscularis and catgut in the serosa, while the majority recommend catgut entirely. The question of how many layers of suture should be made in closing the uterine incision is not any nearer standardization than it was years ago, thus we see the advocacy of one layer, two layers, three layers and even four layers. Again, certain authors recommend interrupted sutures, while others favor continuous sutures, and still others use a combination of the two. Practically all the writers are of the opinion that the uterine mucosa should be skipped in introducing the sutures. O. C. Cox,²⁷ writing on the subject, advocates the closure of the endometrium in cesarean section and presents many sound reasons backed up by experience why this should be done. His paper is short and is quoted in its entirety, as it throws a new light on the much discussed question:

Rupture of the uterus during subsequent pregnancies and intestinal obstructions at any time from one week to twenty-three years after, are the real dangers of cesarean section. Probably infection plays a part in causing these unfortunate occurrences. With modern operating room technique and with patients who have not been subjected to vaginal examinations, there should be a minimum of infection. However, the reports of these two disasters are increasing constantly in number.

It can be understood readily how it is difficult to hold with sutures a wound in a muscular organ, that is alternately contracting and relaxing. Particularly is this true in the puerperal uterus, because during involution there is rapid and marked diminution in the size of the whole muscular structure. This is by some process not exactly understood, and it is plausible that this very process of involution impedes healing of the muscle fibers. If aseptic technique is carried out perfectly and yet we have rupture of the uterus, must we not look for some other fault?

Let us examine the method of suturing. In descriptions of the classical cesarean section the sutures are placed in the myometrium and peritoneum. It is always stressed not to sew the endometrium. The reasons for not sewing the endometrium are not good, but there are many excellent reasons for sewing it. No other epithelial lined organ is closed without the mucosa first being sewed, then why not close the uterine mucosa with a continuous fine chromic suture? The wound in the uterine musculature can be wiped clean and closed without blood entering it from the interior of the uterus. It is well known that a few days after labor, all uteri harbor bacteria. If the mucosa is closed accurately, it will heal tightly in a few hours, thus protecting the sutured muscle. When the mucosa is not closed and the uterus is sutured in the usual manner, there is an eversion of the edges of the mucosa. The muscular fibers of the line of suture are brought into contact with the bacteria laden lochia. Consequently a thin scar of fibrous tissue and peritoneum is the result. Interrupted stitches leave too many knots in the wound. Knots are slow to be absorbed, cause serum to collect around them, and are likely to be extruded into the uterine cavity.

I have used the following method of closure in several cesarean sections, and believe it to be superior to the methods described in most texts.

1. The mucosa is closed with continuous No. 1 chromic catgut.
2. The uterine muscle is closed with two layers of continuous No. 2 chromic catgut, very deep bites into the muscle being taken.
3. The peritoneum is closed with No. 0 chromic catgut and the Lembert stitch is used in making the suture.

Thus, the muscle layer is sealed between sutured mucosa and sutured serosa.

Thom²⁸ reported four classical cesarean sections on one patient, a colored woman, who had been delivered of two living children through the pelvis before the first operation. The first cesarean was done after seventy-two hours of labor for non-engagement. The convalescence was normal. The second hysterotomy was performed a year later after a trial labor, and again the convalescence was normal. Still a year later a third operation was performed, the omentum was found adherent to the parietal peritoneum and uterine scar; the placenta was adherent to the uterine scar. The convalescence was normal and the blood Wassermann test which was done at the time was negative. After another year the fourth section was performed. Adhesions involving the peritoneum, omentum, intestines and anterior surface of the uterus were found. The placenta was again implanted on the old scar. *The uterine wall was abnormally thin in the region of the scar.* He stated that the extreme thinness of the uterine wall, at the site of the previous scar, may have been due to: (a) Excavation due to poor union at the previous operations; (b) thinning out due to intra-uterine pressure at the time of labor; (c) syncytial erosion. It seems reasonable to suppose that all three processes may have shared in the condition. He feels that the case emphasizes the fact that the cesareanized woman needs extra and constant medical supervision during the last month of pregnancy. Because the puerperium following cesarean section is unattended by fever or other manifestations of infection is it

not assuming too much to claim that the scar in such instances is perfectly healed and will stand an equal amount of strain with any other portion of the uterine wall? He concluded by stating that the knowledge of the implantation of the placenta and of the condition of the scar would greatly strengthen our position in regard to our treatment of the cesareanized woman.

Gaspar²⁹ reported the case of a 26-year-old quartipara who had given birth to three babies without trouble. She was in labor many hours with fully dilated os and several ineffectual attempts to deliver with forceps before the condition was recognized and the patient sent to a hospital. Classical cesarean section was done although he stated that it was their intention to do a De Lee operation. The uterus was not removed because the fast sinking patient demanded haste. She died of septicemia.

Hirst and Van Dolsen³⁰ in writing on cesarean section stated that "the risk of cesarean section is in direct ratio to four factors: (1) the length of time the patient has been in labor; (2) the length of time the membranes have been ruptured; (3) the number and technique of vaginal examinations made; (4) previous attempts at vaginal delivery by forceps.

"In an elective case, in competent hands before the patient has fallen in labor, the risk is negligible. All the foregoing factors increase the risk enormously. Whatever may be thought of rectal examinations as a routine procedure, they are desirable and should be performed in any case undergoing a test of labor, as a preliminary to a possible cesarean section later in the course of labor." They described their closure of the uterine incision in three layers with continuous sutures of catgut.

Williams,³¹ in a paper entitled "A Critical Analysis of Twenty-one Years' Experience with Cesarean Section," gave the following conclusions:

1. This analysis is based upon 183 cesarean sections performed upon 145 women up to December, 1920.

2. The operations were done in a series of approximately 20,000 deliveries and comprised 104 single and 79 repeated sections. The latter were done upon 41 women, 34 of whom had two, and 7 three sections each.

3. Although the number of white and black patients in the service was approximately identical, many more cesarean sections were done upon the latter—114 to 169, while 30 to 11 required repeated sections.

4. The following types of operations were done:

- 121 typical conservative sections

- 4 extraperitoneal sections

- 1 postmortem section

- 57 Porro sections

5. The gross mortality was 5.46 per cent but upon deducting the cases in which death was not attributable to the operation, the net mortality was 3.45 per cent, or 4.07 per cent in the conservative and 1.82 per cent in Porro sections. All deaths, except one from hemorrhage, were due to infection.

6. The mortality was 13 times greater in the first 50 than in the last 133 cases—10 to 0.77 per cent. This remarkable diminution was not due to changes in operative technique, but to the avoidance of ascending infection by operating before the onset or during the first hours of labor.

7. The conservative section late in labor is always dangerous, even if vaginal examinations have not been made, while the Porro section is relatively safe. The most important means of lowering the mortality of conservative cesarean section due to disproportion is by learning to determine before the onset of labor whether operation will be required or not.

8. The Porro operation is relatively safe even in infected or exhausted patients, as the absence of the involuting uterus hinders the spread of infection.

9. Disproportion due to contracted pelvis was the indication for interference in nine-tenths of the black, and in six-tenths of the white patients.

10. The several varieties of rachitic pelvis afforded the predominant indication in the blacks, as compared with the simple flat pelvis in the whites.

11. The most frequent non-pelvic indications were eclampsia and serious cardiac decompensation.

12. Cesarean section is not the ideal treatment for eclampsia, and is indicated only in the rare instances in which the cervix is rigid and undilated and venesection has not led to improvement.

13. It is likewise only rarely indicated in placenta prævia. We have done but one section in 66 cases, and regard the rubber balloon as the best treatment.

14. Generally speaking the patient should be sterilized at the third section, either by amputating the uterus or by an operation upon the tubes.

15. We make the abdominal incision below the umbilicus as it permits amputation of the uterus or operations upon the appendages when necessary, without extending the incision.

16. The uterus should be incised *in situ*, and eviscerated before incision only in the presence of infection. Our experience indicates that in normal cases the latter procedure increases the incidence of infection.

17. The uterine incision should be sutured in layers and the greatest care taken to insure the closest approximation of the peritoneal margins.

18. The uterine cicatrix ruptured once in 48 women with repeated sections, as well as in 12 deliveries through the natural passages subsequent to section. The frequency of its occurrence is probably exaggerated, so that the dictum "once a cesarean always a cesarean" is not necessarily correct. On the other hand, the possibility of rupture must always be faced and constitutes the strongest argument against the unnecessary employment of cesarean section for non-pelvic indications.

19. The placenta was inserted upon the anterior wall of the uterus in two out of every five of our cases. Consequently it is frequently involved in the uterine incision. This has no other significance than a momentary gush of blood.

20. The delivery of an asphyxiated child occurs less frequently than is generally believed. Somewhat over one-half of our children cried immediately after delivery, and only 7 per cent were deeply asphyxiated.

21. Notwithstanding the extraordinary value of pituitary extract in stimulating uterine contraction, pronounced atony with danger of death from hemorrhage is still to be reckoned with, and necessitated amputation of the uterus in two of our patients.

22. Uterine adhesions were absent in one-quarter of our repeated sections, and were extensive in one-third of them. They are not necessarily the result of infection, as the puerperium was normal in 36 per cent of the cases in which they developed. In many instances they appear to be associated with imperfect approximation of the uterine wound or with other traumatic factors.

23. The old superstition that boys originate from the right and girls from the left ovary can be definitely discarded. In two-thirds of our patients the corpus luteum persisted until the end of pregnancy and its location bore no relation to the sex of the child.

24. Finally it should be remembered that cesarean section is not devoid of danger, and is relatively safe only when done under appropriate conditions before the onset or during the first hours of labor.

As the uterine cicatrix constitutes a *locus minoris resistentiæ* in subsequent pregnancies, cesarean section for other than pelvic indications should be performed only when absolutely necessary.

It is my conviction that the operation is being abused throughout the country and if accurate statistics as to its results were available that it would be found to be accountable for many unnecessary maternal deaths.

It should be recognized that, although it is frequently the easiest manner of delivering the patient in the presence of various anomalies, it is not always the safest, and that ideal results are obtained in only a few clinics.

Foster³² described a new technic in performing the classical cesarean section. He makes a long median incision extending from the umbilicus to the pubic crest. The incision is made in the anterior surface of the uterus. The incision is closed in two layers with No. 2 chromic catgut; the first layer consists of interrupted sutures skipping the endometrium, the second of mattress-sutures burying the first plane. The parietal peritoneum is then sutured to the uterus all around the closed uterine incision and the rest of the abdominal wall is closed in layers. By this method he claims that subsequent operations may be done extraperitoneally, by going through the same space. This operation, in the reviewer's opinion, presents all the disadvantages of the classical operation and none of the advantages of the low retrovesical operation.

Cameron³³ related briefly the technic which enabled him in 107 successive cases of cesarean section in rachitic subjects to bring the mortality in his practice to under 1 per cent.

Every surgeon who has had a large experience in dealing with cases of repeated cesarean section has probably been hampered on several occasions by numerous and dense adhesions in the region of the former scar or scars. The attachment of the uterus to the parietes can often be diagnosed before the abdomen is opened, owing to movements communicated to the uterus being accompanied by in-dragging of the abdominal wall.

In treating adherent cases, Cameron strongly advocates the practice of evacuating the uterine contents through transverse incisions in the abdominal and uterine walls. By so doing the labyrinth of adhesions may be avoided, and as the uterus is usually tightly fixed to the parietal peritoneum the organ remains there in a state of ventrosuspension. It is probable that the attachment of the uterus to the parietes favors incomplete retraction. Catgut is relied upon entirely as, when properly prepared, it holds the tissues in apposition as efficiently as silk, and has the advantage of disappearing within three weeks. If union of the various elements has not taken place by that time it never will. He is of the opinion that all interrupted sutures lie loosely in tissues after

a few days and so silk does not keep the tissues more firmly lashed together than catgut. The free use of silk within the abdomen seems unjustifiable, as the presence of this durable material may readily lead to the formation of dense adhesions, and, moreover, it may be the cause of great misery if it becomes infected as a persistent sinus forms. Each month the unhappy woman menstruates on to the abdominal wall. Vesical calculi may also originate from silk sutures in the uterus having made their way through the wall of the bladder.

Lawrence³⁴ considered the numerous methods of performing the classical cesarean operation and the present enlarged field of its application, the danger of distant sequelæ that are not often thought of when operating, must be reckoned with, including disturbances due to adhesions and rupture of the uterus in subsequent spontaneous labors.

The technic here described was devised for the purpose and in the hope of avoiding these sequelæ. It was thought, if a technic could be developed which would decrease the length of the incision, perfect union of the incised musculature of the uterus, and eliminate or diminish adhesions, then with correct selection of cases and changes in postoperative handling these dangers might be mitigated.

Experiments in technic were made in 1919 using that then employed by William E. Parke as a starting point. Parke and others then employed the high-low incision and a three-tier closure of the uterus, approximating the uterine reflection of the peritoneum by means of an exposed mattress-suture. After a variety of experiments throughout 1919, the technic here reported was devised and has been employed continuously since then, whenever the classical cesarean operation was performed, except when a hysterectomy was required. It differs from that employed by Parke then and also from all present methods in that there have been adopted the following devices and rules governing the procedure:

1. Various mechanical and technical means to (a) accentuate the high-low principle, (b) shorten all incisions.

2. A method of closing the uterus and all serous surfaces without any exposed sutures or knots.

3. A principle of selection of cases, that while not strictly technical is yet a means of insuring better healing. The principle of selection is that which Lawrence advocated in 1915, *viz.*, (a) absence of repeated vaginal examinations; (b) absence of one vaginal examination unless the technic of the examiner is known to him to be satisfactory (in his own service, rectal examinations are required, vaginals prohibited, unless the first assistant performs them); (c) unruptured or recently ruptured membranes; (d) absence of any operative effort to effect delivery.

4. Changes in postoperative handling involving: (a) combating acidosis, routinely and immediately; (b) combating anemia, when present, by transfusion, preferably of uncitrated blood; (c) early feeding; (d) bed for twenty-one days to avoid disturbance in involution.

Lawrence then gives his personal technic in detail followed by a list of its advantages and disadvantages.

Lyle ³⁵ reported six classical cesarean sections on the same patient. A woman of 29 had a history of rickets in early childhood, was of stunted growth, and her true conjugate diameter was less than 3 inches (7.5 cm.). Although the patient had already had six cesarean sections, she appeared well. At the last operation the uterine wall appeared strong and healthy. A male child was delivered alive. The method or procedure was similar in all cases. The operation was not performed until the patient had been one or more hours in labor. A mesial incision through the body of the uterus and the uterine wound was united by two layers of chromic catgut, the first layer being interrupted through the whole thickness of the uterus, and the second continuous through the peritoneum over the incision.

Maclean ³⁶ related the history of a 30-year-old primigravida in labor two days. Forceps were unsuccessfully applied twice. The pelvis was flat. Cesarean section was performed forty-four and one-half hours after the onset of labor. The uterus was slow to contract. A living child with exaggerated cephalic molding was delivered. At first the patient improved in general appearance, but about one hour after the operation the uterus relaxed, dilated acutely, and a profuse postpartum hemorrhage occurred, drenching the bed and causing almost instantaneous death.

Shaw ³⁷ wrote about the case of a woman with a flattened pelvis, with a diagonal conjugate of $3\frac{1}{2}$ inches (8.75 cm.), and who gave a history of six previous cesarean sections. No difficulty with the previous operations, and this seventh pregnancy advanced quite normally to full time. Labor pains commenced a few days before the calculated date, the patient had severe uterine contractions for three hours before cesarean section could be performed, but the site of the uterine scar was thick and strong, showing no signs of stretching. The operation was uncomplicated, with a living child.

Thomas ³⁸ described four cesarean sections on one patient as follows:

1st...labor, May, 1918.....	baby $8\frac{1}{4}$ pounds
2nd...labor, May, 1919.....	baby $9\frac{1}{2}$ pounds
3rd...labor, Dec. 4, 1920.....	baby $8\frac{1}{2}$ pounds

The omentum was found densely adherent to the parietal peritoneum and anterior uterine wall. Upon opening the uterine cavity the edge of the placenta protruded through the open wound, apparently having been implanted over the uterine scar.

4th...labor, Nov. 6, 1921.....	small baby
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Many adhesions were found, involving the peritoneum, omentum, intestine and anterior surface of the uterus. At incision of the uterus a large portion of placenta protruded and it was evident that this organ was implanted upon the old scar. The uterine wall at this point was abnormally thin. The patient was sterilized. "Knowledge of the implantation of the placenta would greatly strengthen our position in regard to the treatment of cesareanized women."

Johnstone³⁹ gave the method of suture which he has adopted in over 80 cases of cesarean section; while differing from that in general use, it has at least the merit of being simple and rapid.

Three tiers of continuous suture are used, as more perfect apposition can be obtained in this way than by the use of interrupted sutures, and there is less risk of the formation of gaps in the line through retraction of the muscle between the points of suture. The first layer passes through the endometrium and holds its cut edges firmly together so as to prevent the intrusion of blood-clot between them with the risk of the subsequent formation of pits along the line of union. Objection to the passage of sutures through the endometrium is based on false analogy. The Lembert method of suture is indicated when the mucous membrane to be dealt with is constantly bathed by infective material, as in the case of the intestine, but may be discarded when dealing with a sterile mucous membrane such as that of the uterus. The second tier unites the thickness of the uterine muscle, and the third closes the peritoneum. The blanket stitch is preferred to the simple continuous one. Either Luken's or Merson's plain iodized catgut is used.

In all patients operated upon a second time the scar of the first section was practically indistinguishable from the surrounding uterine wall.

Holland,⁴⁰ writing as late as 1921, in discussing suture material used in the classical cesarean section considered that silk-worm gut was the best material, silk the next best and catgut most unsuitable.

Rice,⁴¹ in a paper entitled "An Analysis of the Results in 130 Pregnancies Subsequent to Cesarean Section in 96 Patients," gave the following summary:

"A study of 96 patients with 133 pregnancies following cesarean section disclosed that 76 patients had 92 repeated sections, five of these were performed in other hospitals (other than the Manhattan Maternity and Obstetrical Service of the third division at Bellevue Hospital). Twenty patients were delivered vaginally at term in thirty pregnancies, one had two deliveries and one had six deliveries. Twenty-two of the primary sections were performed in other hospitals. Two patients had premature deliveries besides repeated sections. Seven had a spontaneous miscarriage. Two had induced abortions."

FINDINGS AT OPERATION OF REPEATED SECTIONS (RICE)

<i>Findings</i>	<i>Number of Cases</i>
Moderate adhesions	10
Dense adhesions	8
Adhesive bands	4
Entire anterior wall of uterus adherent to parietal peritoneum	2
Ventral hernia. Mesentery and omental adhesions to peritoneum	1
Dense adhesions interfering with operation	1
Scar thin at upper angle	3

His conclusions were:

The number of cesarean sections could be greatly reduced by more frequent observation during pregnancy, and the use of trial labor in doubtful cases of moderately contracted pelvis.

When cesarean section becomes necessary for delivery, the risks in future pregnancies are greatly lessened if the operation is properly performed.

In subsequent pregnancies when we may expect firm union in the uterine wall, a repeated cesarean section should not be performed without definite indication.

If repeated section is decided upon as the method of delivery, it should always be performed before the end of pregnancy.

Harris and Brown's ⁴² paper is based upon the bacteriologic study of the uterine contents obtained at 50 cesarean sections. In 19 elective sections performed at an appointed time at the end of pregnancy and before the rupture of the membranes, the uterus was uniformly sterile. The same applies to 6 cases in which the classical section was performed within four hours after the onset of labor.

In 5 patients in whom classical section was performed six or more hours after the onset of labor, bacteria could always be demonstrated in the lower uterine segment and there were streptococci in 3 of the cases. Similar results were obtained in 13 low cervical and 6 radical sections, and the uterine contents were sterile only in the 3 cases in which the operation was performed within a few hours after the onset of labor.

Harris and Brown believe that these bacteriologic findings clearly show why the conservative section is safe only when performed at the time of election.

While vaginal examinations and premature rupture of the membranes undoubtedly increase the likelihood of bacterial invasion of the uterus, the absence of these factors in no way insures a sterile uterus. Elevation of the temperature, likewise, is a valuable sign of intrapartum infection, but a normal temperature cannot be accepted as evidence that ascending infection has not already occurred.

Whether the presence of bacteria in the uterine cavity is due to the upward extension of bacteria already in the vagina or to an ascending infection from the vulva cannot be determined until comprehensive studies of the bacterial flora of the vagina have shown whether the occurrence of auto-infection is possible or not.

MORTALITY IN CESAREAN SECTION

Burnell,⁴³ in a series of 100 cesarean sections performed at the Long Island College Hospital, Brooklyn, reported a maternal mortality of 3 per cent, from eclampsia, hemorrhage and pneumonia and a fetal mortality of 4 per cent, three of the infants being premature.

Gordin⁴⁴ said: "The most recent statistics collected by Newell of Boston, gives the mortality at from 2 to 4 per cent in cesarean operation." Williams of Johns Hopkins gives a gross mortality of about 5.5 per cent or a net mor-

tality attributable to the operation of about 4 per cent. McPherson of the New York Lying-In Hospital gives a 1 to 2 per cent mortality in selected cases. Polak of Brooklyn in a report of 2000 cases of cesarean section collected from many clinics in North America, including Johns Hopkins, University of Pennsylvania, Sloan Maternity, New York Lying-In, and Jefferson, reports 2.9 per cent mortality in clean cases during early stages of labor and 6.6 per cent mortality in cases which had been previously examined or handled before admission to hospitals and a mortality of 11.5 per cent in cases thought to be infected. He also reports 200 cases from the Long Island College Hospital with 3.3 per cent in clean cases, 14 per cent in cases handled previous to admission to the hospital and a combined mortality of 6.1 per cent in all cases. Naturally when the operation is done by less experienced operators and in unfit cases, it carries a much higher mortality.

Kane ⁴⁵ reviewed 100 cases of classical and 16 cases of low cervical cesarean section. In 100 cases of classical, 5 died (mortality 5 per cent), 4 from eclampsia and one from placenta prævia in a woman who had general carcinomatous metastases following amputation of both breasts for malignant disease. In the 16 low cervical cesareans performed on patients at least potentially infected, there was one death, giving a mortality of 6.25 per cent. This woman had been in labor ninety-six hours before admission, and high forceps had been attempted three times. Her temperature was 103° F. and her pulse 140 when admitted. She died of septicemia which was undoubtedly present before admission to the hospital on the fourth day. The autopsy showed the uterus to be almost entirely necrotic. The most interesting point in view of the claims in favor of the low cervical cesarean section was that there was a collection of pus between the bladder and the lower uterine segment which was kept out of the peritoneal cavity by the transverse line of Lembert sutures.

Holland ⁴⁶ reported 3314 cesarean sections performed throughout Great Britain from the year 1911 to 1920 in which the average mortality was 4 per cent, with a mortality of only 1.6 per cent in the early uncontaminated cases, but 27 per cent in the late cases or in those in which delivery had been attempted.

Asa B. Davis ⁴⁷ reported 28 extraperitoneal cesarean sections in presumably infected and mismanaged cases of prolonged labor with 2 deaths (7.1 per cent). One woman died the second day of general peritonitis. There was serosanguineous fluid in the peritoneal cavity and cultures showed hemolytic streptococci. The other death was due to pneumonia plus labor.

King ⁴⁸ reported 117 abdominal cesarean sections at the Charity Hospital of New Orleans (excluding the Porro cases in which there were 12 deaths from peritonitis and 2 from sepsis). All the patients had vaginal examinations or attempts at delivery before operation. Mortality 12.0 per cent.

Lewis ⁴⁹ reported a mortality of 10.1 per cent in 158 cases at the Cook County Hospital in Chicago with a corrected death rate of 9.4 per cent.

Krause ⁵⁰ reported 148 suprasymphyseal cesarean sections with 5 deaths (3.3 per cent). In 2 cases peritonitis was the cause, and in another the probable cause. Two patients died before or during operation under lumbar anesthesia

Warren⁵¹ reported 106 cesarean sections with 12 deaths (11.3 per cent), ruptured uterus, 2; previous attempts at delivery, 1; impossible delivery of impacted breech, 1; hemorrhage from placenta praevia, 1; eclampsia (never regained consciousness after the first convulsion), 3; pulmonary embolism, 2; acute sepsis not known before section, 1; ileus, 1.

Baumm⁵² stated that since October 31, 1922, 133 cases of suprasymphyseal delivery occurred in his clinic in a total of 7018 deliveries. This showed a frequency of operation of 1.9 per cent. Of 133 mothers 2 died, showing a mortality of 1.5 per cent. A previous series showed a mortality of 2.4 per cent. Fifty-two were not clean cases; the two deaths were from this group—one died of air embolism on the table, and the other of infection.

Lyon⁵³ reported 20 cesareans with 3 deaths (15 per cent), as follows: (1) Toxemia, eclampsia, acute suppression of urine; (2) peritonitis; (3) peritonitis, septicemia, positive blood culture.

Broich⁵⁴ discussed his subject under main headings, each of them a major symptom often used as an indication for cesarean section:

Internal Diseases.—Cardiacs.—Six patients delivered by abdominal section—5 died. Autopsy in 5 cases revealed mitral stenosis which in 2 cases was accompanied by stenosis of the aorta. In one patient in whom gonorrheal arthritis and endocarditis had been diagnosed, autopsy was refused. All the children remained alive.

On account of diseased internal organs, 13 vaginal sections were performed, 2 mothers died, one due to diabetic coma, the other due to an infection. Of the 10 viable children 2 died, one from asphyxia and one from a rent in the tentorium.

Eclampsia.—Eight women were treated by means of abdominal and 18 by means of vaginal cesarean section. All women recovered. All children extracted by abdominal section remained alive. Of the 14 remaining viable ones, one died of cerebral hemorrhage.

Placenta Praevia.—Eighty-seven were delivered by vaginal section and 13 by abdominal. Of the 87 vaginal cases, 3 died (3.4 per cent), one from hemorrhage, and one from infection. Of the 46 viable children 8 died (17.4 per cent). Of the 13 abdominal deliveries Broich lost one patient who was admitted in a hopeless condition. One child died of aspiration pneumonia.

Contracted Pelvis.—One hundred and forty-eight cases of contracted pelvis were treated by section. Three of them had previously been delivered by cesarean section. Of the 116 transperitoneal deliveries 3 women died: 2 of peritonitis; the third woman died on the eighth day after delivery from suppuration of the frontal sinus. Autopsy showed nothing abnormal with the pelvic and abdominal organs.

Extraperitoneal section was performed in 9 cases. Liquor amnii had been discharged for a period of nineteen to thirty-six hours. Mortality 0. Among the 23 repeated deliveries by section, 16 were second and 5 third operations. Two women died on the sixth and tenth days respectively as the abdominal sutures did not hold. One was a second and one was a third delivery by

section. Of 146 viable children (2 malformations), 4 died, one from asphyxia (prolapse of the cord), one from pneumonia and 2 were premature deliveries.

Breech Presentation.—Eight abdominal sections, large-child breech presentation in elderly primiparæ. Mortality 0.

Premature Rupture of Amniotic Sac; Primary Weakness of Labor Pains.—Vaginal cesarean sections, 15 (10 vertex, 4 transverse, 1 breech). Mothers all survived. Of 10 viable children one succumbed to asphyxia. One abdominal delivery in a primipara aged 38, membranes ruptured fifteen hours. She died of peritonitis on the fourth day. The child died of asphyxia.

Rice,⁵⁵ in an analysis of 133 pregnancies subsequent to cesarean sections in 96 patients, gave the following mortality:

Fetal Mortality.—In vaginal deliveries following section, one stillbirth in second stage, four and one-half hours.

In secondary sections 3 deaths (3.4 per cent):

1. Ruptured uterus
2. Prematurity
3. Prolonged labor

Maternal Mortality.—Three deaths out of 87 cases (3.4 per cent):

1. Ruptured uterus
2. Ruptured wound of abdominal wall
3. Pneumonia and empyema, death, one month after section

Montgomery,⁵⁶ in a paper entitled "Morbidity and Mortality of Cesarean Section," audited the cesarean sections performed in the wards of the Jefferson Medical College Hospital on patients admitted from September, 1925, to September, 1926.

There were 25 sections performed by various operators, all of the classical type, under ether anesthesia. There were 4 maternal deaths (16 per cent). Two died from sepsis, one from peritonitis, one from violent hemorrhage of placenta prævia. Twenty-six infants were delivered, 3 were born dead (11.9 per cent), and 3 died after delivery (11.9 per cent), a total mortality of 23.8 per cent. The 3 stillbirths occurred in cases of antepartum bleeding. Of the 3 infants who died after delivery one was premature, eight and one-half months in a case of placenta prævia, the second was luetic and the third not viable.

THE UTERINE SCAR AND RUPTURE OF THE UTERUS AFTER CESAREAN SECTION

Gamble⁵⁷ presented a detailed study based upon 63 pregnancies occurring in 51 women who had previously been subjected to cesarean section. Fifty-five of these pregnancies followed a single cesarean section, while in 8 there were two operations. A second or third cesarean section was done in 45 cases.

Vaginal delivery occurred in 17 cases. Rupture of the old cesarean scar occurred in one case.

Suggested Causes of Rupture.—1. *Excessive Distention of the Uterus.*—In the cases of rupture reported by Woyer, Couvelaire, and Scheffzek, the presence of hydramnion or multiple pregnancy had subjected the uterus to abnormal distention, which was assumed by these authors to have been a predisposing factor. On the other hand, Gilles, in 1916, reported the successful termination of a twin pregnancy without rupture of the uterus in spite of two previous cesarean sections. The combined weight of the two children was 4950 Gm.

2. *Forcible Intra-uterine Manipulations.*—Version and extraction, the use of hydrostatic bags, uterine tampons, etc., have been mentioned as possible causes of rupture, although it is only in cases of marked thinning of the scar that such factors are of any importance.

3. *Water-Wedge Theory.*—Spalding, in attempting to explain the rupture of the scar in a certain percentage of cases, advanced the theory that a small water-wedge formed by the amniotic sac may serve to dilate the thinned-out scar in exactly the same way that the bag of waters brings about dilatation of the cervix in normal labor.

In 1910, Mason and Williams studied the resistance of the cesarean scar experimentally. They subjected a number of pregnant animals to cesarean section and sometime later removed the uterus for investigation. They attached weights to a strip of muscle containing the scar and increased them until rupture occurred, when it was found that it took place through the sound muscle and not through the scar itself. Their experiments gave such uniform results that they drew the conclusion that a firmly united scar is even stronger than the intact uterine muscle and should easily be able to withstand any strain which the latter is capable of bearing. Moreover, the case reported by Harrar demonstrated that the normal muscle tissue may yield before the cicatrix, although the myometrium in that instance was regarded as having become devitalized. An anatomical study of the well-healed scar shows no reason why it should rupture before the surrounding muscle; it is probable that the statement of Mason and Williams holds true for a "firmly united scar." In the thin poorly healed wound, on the other hand, there can be little doubt that the rupture occurs directly through the scar and not through the adjacent tissue.

As Lane and Couvelaire have pointed out, the first step in the mechanical healing of the uterine scar is the deposition of fibrin between the edges of the wound, which acts as a framework for the ingrowing tissue which will eventually determine the character of the cicatrix. In spite of the constant contraction and relaxation of the uterus, if infection is absent, and the sutures have been so laid that the edges of the incision remain approximated, firm union will almost invariably result. On the other hand, if there is necrosis due to infection, or if the sutures tear through, leaving a gaping wound, there is an ingrowth of endometrium, which may involve almost the entire thickness of the wound. Such a scar, when seen in a subsequent pregnancy, is made up almost entirely of decidua and peritoneum, and its gross appearance in the

unopened distended uterus is characteristic. Instead of the vertical shallow depression seen in the more perfectly healed scars, it is represented by a glistening translucent band of tissue which bulges outward beyond the general surface; while, after the uterus has been emptied, hardened, and cut in cross section, the scar is marked by very deep depressions on both the outer and inner surfaces of the uterus. On microscopical examination it will be found that it is composed almost entirely of thickened and highly vascularized serosa overlying the decidua. There is an increase in the fibrous tissue and a definite decrease in the elastic fibers, while occasionally a few muscle-fibers may be present.

Under ideal conditions the muscle unites perfectly, and its fibers cross the site of the incision as if it had never been made. When, however, there has been no muscle union, the scar is made up solely of decidua and peritoneum. Most scars are marked by funnel-shaped depressions on the outer and inner surfaces of the uterus. The muscle-bundles are not much distended, the formation of fibrous tissue is much less than would be anticipated, and when it is increased, the elastic fibers are correspondingly diminished in number.

Gamble⁵⁷ gave the following conclusions:

1. The weak cesarean scar may be due to a single factor or to a combination of factors, the most important of which is infection.
2. An afebrile puerperium does not give an absolute assurance of perfect healing.
3. The perfection of technique in suturing the uterine incision will undoubtedly lessen the incidence of weak scars.
4. Chromic catgut, in our hands, has proved to be a satisfactory suture material.
5. The uterine wound should not be closed, if possible, until firm contraction of the musculature has occurred.
6. As a rule, fetal elements do not invade the uterine scar.

Schwarz and Paddock⁵⁸ in a beautifully illustrated article entitled "The Cesarean Scar," came to the following conclusions:

In the healing of the incision in the wall of the guinea-pig uterus, after abdominal section, they state that the edges of the wound are held together by the early proliferation of fibroblasts along with capillaries, not only along the line of incision, but also very definitely between the muscle-bundles adjacent to the line. A definite scar tissue develops and this can be clearly demonstrated in uteri from twelve to twenty-five days after the incision. In their cases of twelve days after incision this was quite considerable. In the later stages, for example in their case of ten weeks, the line of scar-tissue formation with its ramifications is so contracted that on histologic examination it is difficult to make out, and it assumes very definitely the normal pattern of an uninjured uterine wall. That muscle regeneration plays no conspicuous part in the final picture should be emphasized from the fact that the very laborious studies of Loeb and his coworkers show that mitotic figures are rarely found in the uterus of the guinea-pigs seven days after delivery and rarely after eleven days when the uterus is injured. This means, in the opinion of the authors, that muscle

regeneration, if it is to play a conspicuous part in the disappearance of the scars, must do it early. It is quite evident from their sections that this is not the case. Endometrial tissue is readily carried along the line of incision and readily implants itself on the peritoneal surface of the uterus. The frequency and extent to which this takes place is undoubtedly due to the marked abundance of endometrial tissue in these uteri. However, the actual peritoneal implantation of this tissue shows how readily and how easily this occurs. This, however, is further evidence of Sampson's implantation theory.

As regards the early healing of the human uterus after incision at cesarean section from the material that they were able to study, the authors would agree with Couvelaire that the deposition of a considerable band of fibrin between the cut muscle edges forms the basis from which healing takes place. That the line of defect in these cases where approximation has been good should be very small is illustrated in their cases by close approximation of the muscle edges. Fibroblastic proliferation, which was definitely evident in their first case, which can be considered as practically normal healing, indicates that the early process is similar to that in the guinea-pig. They felt that the absence of demonstrable scar over a considerable extent of a well-healed wall is due to the fact that the line of scar tissue is small to begin with, and secondly, because of its ramifications along the line of incision between the adjacent muscle-bundles. Therefore, as the scar contracts, it simulates more and more the normal pattern of the uterine wall and is not demonstrable on histologic examination.

They felt that this explanation of the shrinking of the scar as well as its many ramifications between the muscle-bundles add to its strength. They also think that sutures that are placed too tight, particularly the deepest row, will cause an increased amount of necrosis and will cut through more readily, leaving a gaping inner defect in the wound. On account of the low vitality of the tissue under such circumstances, filling of the defect by granulation tissue should take place only after a more prolonged period of time, and thus the much more rapidly proliferating endometrial tissue has an opportunity to enter and line the defect. It is obvious that the more extensive the cutting through of sutures is, the greater will be the amount of necrosis, and therefore the greater the defect. Infection can further increase the necrosis and thereby allow the sutures to cut through more readily.

They feel that in this way many cases of thin scars which are lined with endometrial tissue are readily explained. The reaction around the catgut sutures in their two clean human specimens, with the amount of necrosis around them, suggests that this material is by no means the best. In contrast to this, and in the absence of infection, there was little or no reaction about the silk sutures in the guinea-pig uterus.

They conclude that the most important thing in the technic of elective cesarean section is to obtain good wound approximation with a minimum amount of suturing, with as little tension on the sutures as possible. They feel that a single row of buried interrupted sutures, and an outer running suture after the method used by Williams, should give the best results.

Weber⁵⁹ felt that the pertinent factors in the formation of a weak scar were inclusion of decidua between the sutured muscle, placing the muscle sutures too far apart, incomplete closure of muscle layers, due to retraction of the muscle-fibers after being incised, hemorrhage and shock of operation, producing a lowered resistance to infection, and implantation of the placenta in the scar.

He summarized his article by stating that:

Rupture of the uterus in hysterotomized women is about 2 or 3 per cent, with a mortality of about 50 per cent. A septic puerperium, with a purulent vaginal discharge, is *prima facie* evidence of a resultant weak scar. All cesareanized patients should be hospitalized toward the latter months of pregnancy. One successful normal delivery may be followed at the succeeding pregnancy with rupture. If there is no maternal dystocia and no other contra-indication, the patient may be given a chance to be delivered normally.

He included a case report, the salient points of which were: The patient was delivered by a previous elective hysterotomy with no history of infection. Rupture occurred at the thirty-sixth week, shortly after the inauguration of the first stage of labor. The profound symptoms of shock and hemorrhage were observed and prompt improvement after the removal of the dead fetus and uterus.

Cameron⁶⁰ thought that adhesions within the abdomen were usually undesirable, but in some cases of repeated cesarean section their presence seemed advantageous, since they caused firm fusion between the uterine scar and the parietal peritoneum, thus diminishing the tendency to rupture. Despite various modifications in the method of closing the uterine wound, the danger of rupture in subsequent pregnancies still exists. Cameron has reached the following conclusions:

The gravity of this complication depends, to a great extent, on whether the uterus manages to expel its contents completely or not. (1) If there be only partial extension from the cavity, the uterus cannot retract effectively and death may rapidly ensue from hemorrhage. (2) On the other hand, if the contents are quickly ejected into the peritoneal cavity, and if rupture is unaccompanied by severe shock the patient may actually walk into the hospital and live for some days without operation. In such instances little blood is found in the belly cavity, and the empty uterus remains in a state of firm retraction. (3) In cases in which the uterine wound has been infected there is less loss of blood when rupture occurs, as the margins of the wound have never remained in apposition and the opposed surfaces are non-vascular.

Bailey⁶¹ reported 2 cases of antepartum rupture of the uterus through a previous cesarean section scar. Both mothers recovered. One child was dead and the other failed to revive after removal.

Graham⁶² reported the case of an elderly primigravida who had an obstructed labor due to pelvic contraction. Craniotomy was performed. She recovered. Another pregnancy was terminated with cesarean section. Good recovery. A little more than a year later another pregnancy was terminated by cesarean section with a living child. Two years later she was again preg-

nant and a third cesarean section was performed. When the abdomen was opened the uterus was found to be ruptured with the fetus and the placenta lying free in the abdominal cavity, the membranes were ruptured. Hysterectomy was performed with perfect recovery.

Kosmak⁶³ gave the details of a case of rupture; the reason given was short interval between the two pregnancies, the first having been terminated by cesarean section. The second one went to term and no suspicion of a ruptured uterus arose until the old scar was reopened. The child had died the day before the operation.

E. P. Davis,⁶⁴ in a paper entitled "The Uterus after Cesarean Section," stated that where silk had been used in sewing the uterine wound the danger of rupture was less, while it was thought that the ideal suture material would be silkworm gut.

While the choice of suture material is important; we know that in the classic operation the efficient and accurate closure of the uterine muscle is indispensable. While methods of operation may differ, this must be accomplished.

It is a general principle in surgery that rapid and complete union in wounds is not to be expected in patients whose general condition and power of resistance are greatly vitiated. This holds good in cesarean section, and the obstetrician may be called upon to effect delivery in cases where the general condition of the patient is so bad that it is unsafe to suture the uterus and allow it to remain. Five case reports with microscopic illustrations are given where the author had removed the uterus at the delivery following a previous cesarean section.

Heffernan⁶⁵ reported the case of a woman 38, who had had three previous cesarean sections. There were indications that rupture of the uterus had occurred a short time before operation. He advised performance of cesarean section on such a patient a few days before the estimated date of labor.

C. J. Kickham⁶⁶ reported a case of ruptured uterus in a previously cesareanized woman where the fetus remained intact within the membranes following rupture. He does not agree with the saying, "Once a cesarean always a cesarean," but he also thinks that it is usually safer to operate again, especially if the uterus is distended with fluid or a large fetus.

Strache⁶⁷ published a case report with the following conclusions: (1) Rupture in the scar is less common when the incision is made in the cervix than when made in the body of the uterus. (2) Rupture is caused, as he thinks, not by faulty suture but rather by infectious processes in the region of the wound. He warns against vaginal examinations and suggests rectal examinations in their place. (3) Rupture is the exception and not the rule, especially at the hands of a skilled surgeon. He quotes Döderlein, Guggisberg, Küstner, and Hussy on these various points and indicates that he is an adherent of their views.

Audebert⁶⁸ stated that the results of 38 histologic studies confirm the opinion which he had previously presented at the Congress of Lille in March, 1913, that is, the complete muscular regeneration at the level of the uterine

scar after cesarean section is possible, and furthermore they show the frequency of this muscular regeneration which was perfect 29 times in 38 cases, or 73 per cent; incomplete regeneration of the muscle, 3 times in 38 cases, or 11 per cent; while only 5 times in 38 cases, or 14 per cent, were fibrous scars found. Couvelaire, moreover, seems at present to admit the possibility of muscular regeneration. In concluding, Audebert feels, in a general way, that the uterine scar after cesarean section is histologically and physiologically good in the majority of cases, and this, despite the inevitable possibility of suppuration and infection. He was surprised to find good muscular repair in one of his personal cases, and in a number reported by Gamble. On the other hand, he has noticed that despite an afebrile puerperium and without the slightest suspicion of infection, muscular regeneration was absent or barely attempted. Under these conditions should we, as we did formerly, base our prognosis in regard to the uterine scar on the result of an afebrile or febrile puerperium? In his opinion, it is impossible to guarantee the condition of a postcesarean uterine scar. Moreover, we should insist on the extreme frequency of thinning at the level of the internal surface in the region of the cicatrix, the presence of which can only be ascertained by intra-uterine palpation. The clinician has no right to be positive in either case. We do not know whether or not the scar is firm or weak. What we do know is that in 73 per cent of the cases the scar is muscularly perfect. No matter what we do the risk of a uterine rupture in a future gestation will always exist, and let us not forget that at the present time rupture is found in about 6 per cent of the cases. For this reason he feels that the cesareanized patient should be followed closely and that repeated sections should be performed before the onset of labor.

Audebert and Fournier⁶⁹ reported a case of rupture of the uterine scar at the onset of the third labor in a woman who had had two previous cesarean sections. The rupture occurred while she was being taken to the hospital; she was seized with a severe pain in the hypogastric region during the journey. An operation was performed by Fournier. Abdominal incision. Numerous omental adhesions to the thinned out abdominal wall. Ruptured previous uterine scar on which the placenta was inserted. The placenta was pushed one side and a living child weighing 3600 Gm. was extracted. Subtotal hysterectomy followed. The mother was discharged from the hospital on the twenty-third day. The child died the thirteenth day after having lost 500 Gm. in weight.

Cerné⁷⁰ related the history of a secundipara who had a cesarean section for contracted pelvis. The puerperium had been complicated by high fever; the patient had left the hospital one week after the operation with a high temperature but had nevertheless recovered. Her second confinement was expected at the end of May, 1926. On May 13th, while splitting wood, she felt a violent pain in the abdomen which she compared to a tearing sensation in the abdomen. She had to lie down on the ground until she was carried to her bed. She was taken to the hospital where she was seen by the midwife in charge, who noted nothing abnormal. She was seen by Cerné twenty-two hours after the

accident. He made the diagnosis of ruptured uterus and operated. The fetal sac containing the fetus was delivered intact, as it was found in the abdominal cavity. The uterus was contracted; it was ruptured at the site of the previous cesarean scar where the placenta had its insertion. Subtotal hysterectomy was performed. The mother recovered and left the hospital on the twenty-fourth day.

Kerr, McIntyre and Hendry,⁷¹ at a meeting of the Section of Obstetrics and Gynecology of the Royal Society of Medicine, on June 5th, 1924, contributed a conjoint paper on wounds of the gravid and non-gravid uterus—a study in uterine scars.

In discussing the question of scars following cesarean section, Kerr quoted the fact that, of patients who went into labor subsequent to this operation, the uterus ruptured in 4 per cent, and that the vast majority of scars following the classical operation were far from satisfactory. The reasons for the existence of this unsatisfactory state of affairs, when the operation was carried out through the contractile portion of the uterus, were given as follows: (1) The difficulty in securing complete asepsis; (2) the rapid degenerative changes occurring in the uterine muscle; (3) the irregular disposition of the sheets of muscle, making it impossible for the individual fibers to be accurately apposed; (4) the necessity imposed on the surgeon of using a ligature for hemostasis as well as to keep the surfaces in apposition; (5) the frequent situation of the placenta on the anterior wall (in some 40 per cent of cases), causing an unsatisfactory condition for the healing of the scar; (6) the liability of the ligatures to go through the decidua, and by pressure to cut through that layer, causing a fibrotic scar on the inner aspect of the uterus. He, therefore, advocated the use of the incision through the lower uterine segment. Some of the chief points in favor of this operation were that the wall of the uterus in this area was quite thin, the tissue much less vascular, and the surface of the wound could be brought more accurately together, thus preventing the formation of "blood pockets." This area was more passive, and less disturbed, than in the upper segment. The wound was completely covered with the bladder wall and the peritoneum, thus preventing any infection spreading to the abdomen. The likelihood of adhesions forming was much less. The wound was not put on a stretch in a subsequent pregnancy, and the strain, even in a subsequent labor, was considerably less than if the scar were in the upper part of the uterus. He had never met a case of rupture of the scar when the operation was performed in this way, although some such cases had been reported from France.

McIntyre presented a paper on the histologic studies of various uterine scars, and showed a series of microphotographs illustrating their histology. The first of these was a wound produced by a cervical dilator. The remaining slides were chiefly devoted to demonstrating the histology of scars resulting from cesarean section. All but one of these were taken from scars following the classical operation. Speaking generally, they showed that the scar consisted of a considerable proportion of fibrous tissue, but muscular continuity could be demonstrated in most cases, right across the line of incision. The

thickness of the wall in the line of the scar was diminished in nearly every case, but was increased in the immediate vicinity. This diminution in thickness varied considerably. In some cases the scar was dangerously thin. Another interesting point was shown in some cases, namely, isolated portions of the mucous membranes had been caught between the two surfaces of the incision, or possibly had migrated there. In some of the slides the cavity made by non-absorbable sutures was visible, and this fact had led McIntyre to invent a catgut having strands of silk embedded in it. However, he considered that it was too soon to make any statement as to the value of this new suture material.

Hendry discussed the uterine scar after conservative cesarean section, (1) when the incision was made in the active contractile portion of the uterus, (2) when the incision was made in the lower uterine segment. He dealt with the macroscopic findings in a number of "repeat" cesarean operations. In describing these cases it was remarkable how often dense adhesions occurred in cases where the classical operation had been performed, whereas in the incision through the lower uterine segment there was not a single case in which adhesions occurred in the region of the scar. He considered it a great advantage for the patient to be in labor if this technic was undertaken, as the lower uterine segment was then well formed, as well as a solution of the problem of unsatisfactory uterine scars due to cesarean section.

J. T. Williams,⁷² in his publication entitled "Care of Pregnancy and Labor in Patients Previously Delivered by Cesarean Section," stated that his experience, both with the repeated cesarean section and with a series of 10 patients safely delivered one or more times by the natural passage after a previous cesarean section, has led him to believe that the maxim, "Once a cesarean always a cesarean," is unscientific and unjustified. The future of a cesareanized patient should be decided upon the merits of the individual case, guided by rules based upon clinical experience and experimental evidence.

In addition to the temporary indications above referred to, there is a distinct class of cases where cesarean section is performed in the absence of a distinct pelvic indication because, the patient having lost her first baby after a difficult operative delivery, usually a dry labor or primiparous breech, both the obstetrician and the patient desire to take no chances in the second labor. This indication may be unsound, but 3 of Williams' cases were of this class, where cesarean in the second pregnancy (performed by another obstetrician) was followed in the third by an easy normal labor.

The experimental work of Mason and Williams showed that in animals a perfectly healed scar would withstand any strain which could be borne by the muscle itself. J. Whitridge Williams, Losee, and others have demonstrated that in a perfectly healed cesarean scar regeneration of the muscle-fibers takes place and the appearance of the scar is histologically equal to that of the rest of the uterus, but each reported the occurrence of defective scars in which rupture had taken place.

Holland had collected 92 cases of ruptured cesarean scars from the literature. Of these, 36 ruptured during pregnancy, and 48 during labor (the rest

not stated). The same writer collected reports of 1605 cesareanized women from twenty-five British clinics. Of these, 1103 were followed up, among whom 487 became pregnant again. Delivery by the natural passages occurred in 78; rupture of the scar in 18; repeated cesarean section in 352; miscarriage in 47; and the remainder were undelivered at the time of the report. In other words, he found that rupture of the scar in subsequent pregnancies occurred in 4 per cent, but that nearly as many ruptures took place during pregnancy as during labor.

The mortality of cesarean section is variously estimated by different writers, ranging from 2 to 4 per cent, according to Newell, to 10 per cent according to J. W. Williams. If the incidence of rupture of the scar is lower than the mortality of cesarean section, it would seem logical to allow these patients, where there is no other indication for cesarean, to go into labor and be delivered by the natural passages. It is of course important, however, that all such patients should be kept under the closest observation during pregnancy and delivered in a well-equipped hospital under the personal attendance of an obstetrician qualified to do abdominal surgery.

J. T. Williams' experience has confirmed this opinion, he having performed 16 repeated cesarean sections, in only one of which was any considerable thinning of the scar found, and in that instance the thin place corresponded to an area alongside the old scar where an interstitial fibroid $1\frac{1}{2}$ inch in diameter had been removed at the previous cesarean.

On the other hand, where there is a permanent indication for cesarean section persisting in subsequent pregnancies, such as contracted or deformed pelvis, there is no justification for allowing the patient to go into labor, but elective cesarean section should be the method of choice.

J. T. Williams delivered 10 patients (two of them more than once) by the natural passages, following cesarean section, with a normal result. An abstract of these cases is given.

Guérin-Valmale and Gaudière⁷³ gave a brief description of a uterus removed from a young woman at her second pregnancy, on the insistence of her husband. The first child had been delivered by cesarean section and lived, also the child removed at the present operation.

Examination of the uterus disclosed the uterine wall to be perfectly reconstructed, anatomically, at the point of the first cesarean section. "It is a true *restitutio ad integrum*."

P. Keller⁷⁴ reported 2 cases. He pointed out that these cases indicate that rupture may occur not only in the cesarean section scar but also at the point of adhesions in other parts of the uterus, *i.e.*, adhesions to the peritoneum. He says that even though there is only a low percentage of ruptures in later pregnancies (about 4 per cent), this danger must still be given serious consideration, especially since there is an ever growing list of indications for cesarean section.

Max Wetterwald⁷⁵ reviewed the literature, and concluded his article as follows: On the basis of his study, it is evident that the danger of rupture of the uterus is very slight after cervical section. As factors leading to rupture,

the following may be considered: Faulty technic of suture, infection of the wound during confinement, lengthening of incision, use of intra-uterine interventions for the purpose of hastening delivery (*i.e.*, version) and especially the occurrence of placenta prævia in the next pregnancy. Surgeons should be very careful in their use of hypophysis extracts. Rapid succession of pregnancies is hardly to be looked upon as a cause of rupture.

In all cases of cervical cesarean section it is imperative that women who have once been delivered by this method should place themselves under the regular care of a physician during the next pregnancy and at the time of delivery be cared for in a clinic.

Asa B. Davis,⁷⁶ in an article entitled "The Ruptured Uterus," stated that, in 1909, Ralph Waldo Lobenstine read a paper entitled "Rupture of the Uterus during Labor." His study was based on the records of the New York Lying-In Hospital from 1890 to 1909, and the paper was published in the *Transactions of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons*, 1909, and also in the *Bulletin of the Lying-In Hospital*, Volume 6, No. 2.

Davis reported 184 cases of ruptured uterus in the service of the New York Lying-In Hospital. He included the 78 cases found in Lobenstine's article, the remaining 106 having occurred since 1909. The incidence of rupture of the uterus was 1 in 810 cases. In these 184 cases there were 88 complete ruptures. Included in the total of 88 complete ruptures were 24 which occurred through former cesarean scars. While rupture through the cesarean scar in a subsequent pregnancy is a serious accident, Davis finds that the prognosis for the mother is far better than in other cases of complete rupture. Of the 24 mothers included in this group, 21 recovered. For the baby the prognosis is bad, 5 out of 24 were saved. In 4 instances subtotal hysterectomy was done, 2 of the 3 maternal deaths following this operation. He further stated: "In many of these cases we find considerable hemorrhage and well marked shock, while in others comparatively little bleeding occurs, separation having taken place, the wound is plugged by the placenta. In some there had only been slight union of the muscle following the previous cesarean, and the rent occurs through scar tissue which does not bleed seriously." He believes that the best treatment for these cases is to freshen the edges and re-suture the wound, ending the operation as quickly as possible and postponing further operative procedure, until some future time when the patient will probably be in better condition.

He feels that any patient who has been subjected to cesarean section should be in the hospital a week or ten days before expected full term in a subsequent pregnancy, and where it is known that a patient must again be delivered by this operation, it should be done before the onset of labor.

Davis states that in the rupture of the cesarean scar we are dealing with a very different proposition from the conditions which are found in the ordinary complete rupture. These wounds are not infected; they are limited to the cesarean scars, and the tissues about them have not been unduly stretched and contused.

Maxwell⁷⁷ reported a case of rupture of the scar following low cesarean section. Mrs. A. V., a Greek, aged 27, a multipara, was seen in the outpatient department of the University of California Obstetrical Service in the seventh month of her second pregnancy. She had been delivered of her first child seventeen months previously by cervical section, by an experienced obstetrician, after some hours of labor. A cephalopelvic disproportion was the reason for section. Her convalescence was uneventful, and she was discharged after thirteen days.

The pelvic measurements, physical examination and pregnancy were normal, but the patient was advised to report to the hospital with the onset of labor pains. In general, it has been the policy of the department not to permit a patient to attempt natural labor after a previous cesarean section.

Labor began late at night, just at term, but the patient did not enter the hospital until four hours had elapsed, at which time the pains were coming every three minutes and were non-expulsive in character. The membranes had not ruptured, and there was no hemorrhagic discharge. No rectal nor vaginal examination was made, and she was immediately prepared for a laparotomy. Within an hour the patient was catheterized and anesthetized; the old scar extending from the umbilicus to the symphysis was excised and the abdominal cavity entered. A few omental adhesions to the former midline incision were readily freed and the lower portion of the uterus presented. Much to her surprise, a fair-sized hematoma about 3 inches (7.6 cm.) in diameter was found under the peritoneum at the vesico-uterine junction. The peritoneum was excised at this point, and the blood-clot removed, which showed that the bleeding was coming from a rent in the uterus just behind the bladder. The rupture was about 2 inches (5 cm.) long, running in a longitudinal direction, and a finger was passed through the separation directly into the lower uterine cavity. There was no difficulty in separating the bladder off the uterus, enlarging the incision through the rupture and delivering the child. An 8-pound (3.6 Kg.) baby girl was delivered in good condition. The mother made a rapid recovery, and was discharged on the fourteenth day.

Calvanico⁷⁸ reported the case of a woman, 37 years old, delivered by a previous cesarean section. On incising for the second operation, on the anterior face of the uterus there was seen a protruding portion corresponding to the cicatrix of the previous operation. The second incision skirted the edge of this protrusion. The wall was thin, like connective tissue, and corresponded to the implantation of the placenta. In detaching the placenta it remained adherent to the cicatrix. The cicatricial tract was excised. Histological examination of the cicatrix gave the following: In some points the elements of the musculature of the uterus resembled muscular fibers of gestation; that is, they were hypertrophic in the highest degree, hyperplastic to a certain degree.

In the tract corresponding to the cicatrix there appeared a space 2 to 3 cm. wide on the myometrial walls, and then a narrow stratum 1 Mm. wide. This thread represented a very thin bridge between the two walls of myometrium. It was made up largely of connective-tissue fibers with a few smooth muscular elements. The external surface was covered by a delicate thin stratum of

peritoneum made up of endothelium and by a thin connective-tissue stratum which was confused with the cicatricial one of the cesarean wound. Numerous blood-vessels ran in the thickness of this little tract.

On the uterine surface, where it does not increase gradually but slips up abruptly from the thin tract to the walls of myometrium on both sides, placental villi were implanted. In this small tract villi invaded the connective tissue which was reduced to $\frac{1}{2}$ Mm., and the tissue was almost entirely constituted of subserous connective tissue and that not very abundant.

This histological examination confirms the diminished resistance of the uterine cicatrix after cesarean section, especially when, as in this case, recovery was disturbed by suppuration.

CESAREAN SECTION UNDER SPINAL ANESTHESIA

Astley⁷⁹ stated that the situation with the victims of toxemia is briefly that, during the progress of pregnancy, either solely because of pregnancy or because of antecedent pathology plus pregnancy, a condition develops which jeopardizes the life of the mother, and carries with it, therefore, at least an equal hazard to the life of the child.

In considering the treatment of the mother the therapeutic situation may be epitomized as follows: If reduction of metabolic activity by rest and by limitation of diet, and the increase of elimination of waste products by proper measures, do not bring relief, the question of termination of pregnancy is brought up. If termination of pregnancy is decided upon, the details of each step necessary to delivery must be considered and evaluated; and if the patient is seen in the crisis of eclampsia, the same consideration is no less necessary. He considers it logical to relieve the mother of the strain of the continuation of pregnancy, if this can be done without adding factors of risk greater than those already being faced.

Possible maternal dangers in a rapid delivery are:

1. Shock from traumatism, if delivery be attempted by the natural route where the parts, either because of the period of pregnancy, the age of the patient, or local conditions are unyielding.
2. Infection of unavoidably traumatized tissues in the presence of lowered general resistance.
3. The hazards of the anesthetic in the presence of kidney and liver incompetency, and of cardiovascular strain incident to high blood-pressure.

There is the same situation in regard to the child:

1. The child shares with the mother in the toxemia and enters life with that certain, though unmeasurable, handicap.
2. Rapid delivery entails more physical risk than one of deliberation.
3. Prematurity will lessen the resistance to both the toxemia and the physical strain of delivery.

The anesthetic used in the delivery of the mother may be sufficient to turn

the tide against the child, where resistance would have been sufficient otherwise, by making resuscitation difficult.

Astley believes, then, that spinal anesthesia is the method of choice, to be used in the interest of the mother, in certain cases of toxemia of pregnancy because :

1. It allows of the most rapid emptying of the uterus, that is, by cesarean section, with the minimum shock to the patient, because its action is that of a nerve-block with complete muscle relaxation of the abdominal wall, permitting most expeditious work.

2. At the same time it gives us the benefit to be derived from lumbar puncture in the lowering of cerebrospinal pressure, and from the lowering of blood-pressure which its use entails.

3. It adds no element of hepatic toxemia or renal irritation, and reduces blood-pressure instead of elevating it as oxygen and nitrous oxid may.

In the interest of the fetus, spinal anesthesia is especially valuable where, because of marked toxemia or because of prematurity, fetal resistance is at a low point. The reason for this is: It adds nothing to the blood which may interfere with resuscitation, or with the functioning of any other already impaired vital process. Its use, therefore, is particularly indicated where even more than average importance is attached to the life of the child, as in elderly primiparæ who have had renal impairment antedating pregnancy, and where conception, therefore, may not be allowed to occur again.

Thirteen case reports are given. Twelve patients, all primiparæ, one twice operated upon, giving thirteen operations. In the series, 2 mothers died, one from hemorrhagic nephritis, and the other from pneumonia. Two children died, one at 6 months, surviving three days, and one at $6\frac{3}{4}$ months, surviving two days.

The method of spinal anesthesia used was that employed at the Samaritan Hospital, Philadelphia, in the surgical clinic of W. W. Babcock.

H. Krause⁸⁰ felt that, with a few exceptions, cesarean section, as well as all other gynecological operations, should be done under tropacocain lumbar anesthesia. Only in cases in which, on account of the form of the spinal column or for other reasons, lumbar anesthesia could not be carried out, chloroform ether narcosis was used. Lumbar anesthesia was accomplished in the following manner throughout the whole period of time: In the lateral position puncture was made in the lumbar sac between the second and third or between the fourth and fifth lumbar vertebræ. After a few c.c. of clear liquor have flowed out, 8 c.c. of liquor are drawn out by suction, combined with 2 c.c. of a 5 per cent solution of isotonic tropacocain solution (Merck) already contained in the syringe, and this is very slowly and carefully injected. Before the patient is placed on the operating table she is allowed to lie in the dorsal position for about five to ten minutes. Previous to February, 1910, stovain was used in place of tropacocain. Formerly a dose of 0.0004 scopolamin and 0.01 morphin was given before inducing lumbar anesthesia with tropaco-

cain. But now for some time scopolamin morphin has been omitted in cesarean section out of consideration for the child.

Unfortunately, this clinic experienced 2 deaths in connection with lumbar anesthesia, the only two which ever occurred in this form of anesthesia, and it is especially noteworthy that they both occurred in connection with cesarean section. A third case might also be added to these. This involved grave paralysis after lumbar anesthesia in the case of a woman on whom cesarean section was to be performed; the woman, it is true, escaped with her life, but the child was fatally injured.

It is especially noteworthy that in all three cases the patients were unusually small women (1.24 M., 1.40 M. and 1.39 M. tall), so that one immediately thinks of an overdosage, all the more so since lumbar anesthesia has been given to several thousand women in the same manner in gynecological operations without any injury at all. Vogt in a recent article described a similar case, and thought that the preparation of the patient with scopolamin morphin should be blamed for death in lumbar anesthesia. Vjaschske also described a case of death in cesarean section under lumbar anesthesia but gave no reason or even conjecture concerning the cause. In one of the patients autopsy revealed thymus persistens, but Krause still believes that it can be assumed that in all three individuals it was a matter of constitutional inferiority, accentuated by lowered resistance caused by pregnancy. In any case, three casualties should serve as a warning and he states that in his clinic very small, especially hunchbacked patients on whom cesarean section is to be performed, are not given lumbar anesthesia any longer. Likewise, the previous dosage of scopolamin morphin, before lumbar anesthesia, has been omitted for some time in cesarean sections, since it has been found that in a cesarean section with apparently normal course, a child showed symptoms of scopolamin poisoning and died on the third day with cyanosis and cramps. The omission of scopolamin morphin before operation results in no disadvantages.

Boursier, Nard and Rivière⁸¹ reported the case of a primipara, aged 24, with double congenital luxation of the hip, complex and atypical imperfections of the pelvis, marked above all by a contraction of the anteroposterior diameter and considerable projection of the lumbar vertebræ. Classical cesarean section at term after sixteen hours of labor was performed. Lumbar puncture was difficult on account of the excessive lordosis but was finally accomplished between the eleventh and twelfth dorsal vertebræ. They were struck by the fact that the operation was bloodless even without the injection of ergotin. Both mother and child recovered. The fetus, although the membranes were intact, and there had been no tendency to engagement, presented a very marked depression of the left frontoparietal region, due to the pressure of the lumbar column. Although extracted rapidly, the child was very difficult to resuscitate and was in a state of asphyxia pallida. This could hardly have been caused by the type of anesthesia used.

Brindeau⁸² recently wrote that spinal anesthesia is little employed in obstetrics, as general anesthetics are very well borne by the pregnant woman.

However, this mode of anesthesia can render great service, principally in certain cases of obstetrical surgery.

It was Doleris who first thoroughly studied spinal anesthesia for the woman in labor, but his investigations were not followed. Only such authors as Audebert, De Rouville and Delmas have praised the advantages of this procedure. Brindeau had carried out 232 spinal anesthetics on pregnant women. This mode of anesthesia presents certain characteristics which are of note from the point of view of obstetrical physiology. *Its effect is to increase uterine contraction and retraction while it paralyzes the whole non-contractile zone of the cervicovulvoperineal passage.* These physiological properties are of the greatest value in the cesarean operation; they explain the almost complete absence of hemorrhage.

Brindeau has performed 102 cesareans under spinal anesthesia. In 71 cases the operation was suprasymphyseal and in 31 cases classic. In the 102 attempts, he was forced to abandon it 6 times, on account of the impossibility of making the lumbar puncture. In one case the anesthesia had no effect and in 8 cases it was necessary to give some whiffs of ether. In all the other cases the anesthesia was perfect, and the operation proceeded in ideal fashion. It is necessary to state, however, that spinal anesthesia is not without danger for the pregnant woman, as there were 2 deaths in 232 cases; one of them was suffering from generalized edema and pulmonary emphysema, but the other seemed absolutely healthy. Complications were exceptional, little or no vomiting, headaches rare, one case of retention of urine lasting a month, one slight and transient paralysis of the sixth pair of nerves. The lumbar puncture was always used, followed by injection of 6 to 7 Cgm. of a 10 per cent solution of stovain. At present he prefers a preparation in which 8 to 10 Cgm. of powdered novocain are dissolved in the spinal fluid of the patient.

Brindeau concludes, from his experience, that spinal anesthesia renders the cesarean operation very much easier, particularly when one selects the suprasymphyseal procedure.

Lantuéjoul⁸³ stated that the history of spinal anesthesia in general, and its application to obstetrics in particular, may be read in the thesis of Malarch (Paris, 1901). He discussed the advantages and disadvantages of the method as applied to purely obstetrical manipulations, such as the application of forceps, version and extraction, and the repair of birth injuries. The technic and the use of various drugs from cocain to stovain were discussed. He repeated Brindeau's statement at the Congress of Geneva: "The results are surprising, the cervix and the vagina are flaccid and as paralyzed, and despite this, the uterine contractions are not arrested." Among his case reports he included four cesarean sections of the classical type, for contracted pelvis. Each time it was noted by Brindeau, in whose service the operations were performed, that the uterus contracted vigorously, more so than under general anesthesia. In one case the uterine wall was so thick that it was impossible to take in the two sides of the incision in one bite of the needle. In another case the delivery of the placenta through the incision was spontaneous. The infants cried immediately, and the convalescence was perfect in all the mothers.

Brindeau ⁸⁴ at the March 9, 1925, meeting of the Société d'Obstétrique et de Gynécologie de Paris, reported his first death under spinal anesthesia, his one hundred and ninety-fifth case of that type of anesthesia. This was a low cervical cesarean section performed on a primipara 27 years old, in labor for fifty hours. The child was very large (5250 Gm.), the head was at the superior strait and the dilatation was slight. The woman was obese and considerably edematous. The lumbar puncture was difficult, but successfully accomplished after five or six attempts. Six or 7 Cgm. of stovain was injected. After one minute the parturient was placed in the horizontal position and then in the Trendelenburg. As the operator was about to make the incision she became uneasy, the heart and respirations stopped suddenly, the face became cyanosed and the pupils widely dilated. Hypodermic injection of caffein and ether, and an intracardiac injection of adrenalin were administered without success. After eight or ten minutes of artificial respiration, the fetus was extracted by cesarean section. The child was born in a state of asphyxia, but was soon revived. The heart was massaged by the intra-abdominal hand through the diaphragm, intracardiac injections of adrenalin and artificial resuscitation were resumed, but in spite of all efforts it was impossible to bring the woman back to life. At autopsy, the heart was soft, the liver showed fatty degeneration and the spinal canal contained some blood. Brindeau stated that ether or chloroform might also have caused this accident but that it is impossible to tell.

At the Obstetrical and Gynecological Reunion of Montpellier, held February 3, 1926, Devèze, Roume, Madon, Delmas, Coll de Carrera, Rouville and Forgue took part in a symposium on spinal anesthesia, as applied to gynecology and obstetrics. Their individual technics, the indications and contraindications were discussed. The articles dealt largely with spinal anesthesia in purely obstetrical procedures. But little is said about cesarean section as such. Delmas ⁸⁵ stated, however, that in the course of a cesarean section the uterus emptied of its contents, contracts readily and firmly and that he has never seen secondary hemorrhage.

Devraigne, Suzor and Laënnec ⁸⁶ reported the case of a secundipara, on whom a low retrovesical cesarean section was performed under lumbar anesthesia on April 4, 1927, for placenta prævia. Ten Cgm. of novocain was injected. The operation was simple, there was practically no bleeding from the segment, no shock was observed and the convalescence was normal and afebrile. Four days after the intervention, April 8, the patient complained of a feeling of weight in the lower limbs and muscular weakness. The next day, April 9, the patient presented an absolutely complete quadriplegia. The lower limbs were paralyzed, and the woman could execute absolutely no movement with them. The reflexes were abolished although sensation was not disturbed in the least. The muscles of the trunk and upper limbs were equally paralyzed and the olecranon and radial reflexes were abolished. The paralysis reached the muscles of the neck and occipital region, although less completely. There was no ocular, lingual or velopalatine paralysis. It was the clinical picture of an extending poliomyelitis, but much more rapid than

an infectious poliomyelitis. Very happily these paralytic phenomena improved rapidly and spontaneously. On April 11th, four days after the onset of the symptoms, the paralysis had disappeared, and the only trace of the disease left was a slight diminution in the muscular strength of the extensors of the lower extremities. On April 26th, the patient was discharged well without any sequelæ.

The reviewer's experience with spinal anesthesia is limited to 9 cases. Eight abdominal cervical and one vaginal cesarean sections were performed under this form of analgesia. The indications for its use were: Active pulmonary tuberculosis in 2 women, acute respiratory tract infection in 5, and valvular heart disease in 2.

The technic employed was the following: The gravida is given $7\frac{1}{2}$ Gr. (500 Mg.) of caffein sodium benzoate. A spinal puncture needle is introduced between the second and third lumbar vertebræ with the woman in sitting posture and the body flexed upon the knees. A syringe is adapted to the needle and a sufficient amount of spinal fluid is withdrawn to dissolve 100 Mg. of novocain crystals (the sterile novocain crystals are available in glass ampuls). The spinal fluid novocain solution is then slowly injected in the spinal canal. The patient is allowed to remain in the sitting posture for two or three minutes, then she is placed in the supine position with the head slightly elevated. After fifteen minutes she is placed in a moderate Trendelenburg position and the operation is begun. Six hours after operation the injection of caffein sodium benzoate is repeated. The anesthesia, in this small group of cases, was very satisfactory. No postoperative headaches were observed, and the puerpera were all free from complications. As far as the low cervical cesarean section is concerned, this is the ideal form of anesthesia, as it makes the operation practically bloodless, and gives all the necessary relaxation in the region of the lower segment. In the Carney Hospital Gynecological and Obstetrical Service, the reviewer used it only when ether anesthesia was contra-indicated, as all the cesarean sections, when possible, are done under this form of narcosis, by far the safest, in his opinion. Spinal anesthesia, again, is not as safe as local infiltration anesthesia, but one operates with much greater ease with the former because of the relaxation, "the abdominal silence" of the French authors.

CESAREAN SECTION UNDER LOCAL ANESTHESIA

Irving's ⁸⁷ technic is given as follows:

About two and a half hours before beginning the operation the patient is placed in a darkened room adjacent to the operating room, and for the purpose of keeping out extraneous sounds, her ears are plugged with cotton soaked in oil. She is then given, subcutaneously, morphin grain $\frac{1}{6}$ and scopolamin hydrobromid grain $\frac{1}{200}$. The morphin is not repeated, but at forty minute intervals the same amount of scopolamin is administered until the patient is dozing.

Usually three or four supplementary doses of scopolamin are necessary. When the patient falls asleep a folded towel is placed over her eyes and she is transported gently to the operating room and placed upon the table. A nurse sits by her head and records the pulse rate at frequent intervals, but nothing is said to the patient under any circumstances. Absolute quiet is enjoined upon everyone in the room and the rattling of instruments or basins is carefully avoided. At this point another dose of scopolamin, grain 1/200 is given.

The site of the incision, which starts just below the umbilicus and ends above the pubis, is now infiltrated with 1 per cent novocain, using a hypodermic syringe with a fine needle. With a larger needle and syringe the operator next injects the subcutaneous tissue and partially infiltrates the fascia by a series of punctures made downward at right angles to the skin surface. He now waits five minutes by the clock. If he starts the skin incision earlier he will arouse the patient and immediately get into difficulties. At the end of five minutes he divides the skin and subcutaneous tissue, further infiltrates the fascia and incises it. The peritoneum is now injected with novocain and opened in turn. The lower angle of the incision is drawn downward and to the right, and a stay suture of chromic catgut passed into the uterine muscle just above the bladder reflection of the peritoneum. With this suture left loose, the upper angle of the incision is now drawn upward and to the right, and a second stay suture placed.

As the assistant draws upward on the stay sutures he not only holds the uterus in apposition to the abdominal wall and thus minimizes the spill of uterine contents into the peritoneal cavity, but he also corrects the usual right lateral torsion of the uterus by causing its anterior surface to rotate from right to left. In this way the incision made between the stay sutures will be more nearly in the median line of the organ than if that portion of it were incised which lay originally under the abdominal wound.

Since the uterine muscle and its enveloping peritoneum are insensitive, no novocain is here required. The viscus is opened cleanly between the stay sutures with a sharp knife. If pregnancy has advanced beyond five months, the membranes are ruptured, a foot is grasped and the fetus extracted in the usual manner. If pregnancy has not reached five months, the intact ovum is separated by the finger so that it lies free in the uterine cavity and is extruded through the uterine wound by pressure on the side of the abdomen. In this way one may be sure that the uterus is completely empty.

The uterine musculature just beyond each end of the incision is now trans-fixed by a long sharpened steel knitting needle which replaces the stay suture. The portion of the organ which we wish to suture now rests temporarily suspended in the abdominal wound, leaving the hands of the assistant free for other purposes, effectively preventing any further spill and acting as a plug to prevent the extrusion of intestines. A towel is now placed on either side of the uterus under the needles and clamped to its fellow of the opposite side above and below. If the patient is in the second half of pregnancy and the placenta consequently has not been removed with the ovum, it is now extracted. The operator then sutures the uterus in three layers, the first continuous, the second interrupted, and the third, the peritoneal stitch, which is continuous, is designed to overlap the serosa and give extra security against leakage through the wound.

Occasionally the patient mutters incoherently during the operation, and sometimes becomes somewhat delirious. This does no harm and need not disconcert the operator. Enough restlessness occurred on two occasions to require primary

ether and on two others to necessitate gas-oxygen. This complication took place among our earlier cases and has been avoided in our later work by the use of the purest preparation of scopolamin obtainable, and by more careful attention to details of technique. Postanesthetic vomiting is of course absent and operative shock is reduced to a minimum.

Thirty-one cases have been operated upon by Newell, Irving and other members of the staff of the Boston Lying-In Hospital at stages of pregnancy varying from seven weeks to full term. Fifteen viable infants were delivered and all survived. No injurious effect of morphin and scopolamin upon the fetus has been noted. It has been Irving's experience that babies thus delivered have cried more promptly than those removed from the uterus when operating under ether anesthesia, and it is his practice to have them taken immediately from the operating room lest they arouse the patient.

Indications and conclusions are given as follows:

Cardiac Disease.—Seventeen cases of heart disease who had been decompensated have been delivered by this method. In seven, previous breaks in compensation had been restored by appropriate treatment. One of these seven patients died of pulmonary embolism on the seventh day after a week of normal convalescence.

There were nine cases in which compensation had not been completely established but in which delivery seemed indicated because the patients were losing ground. One patient died from cardiac failure on the seventh day, and a second, who entered with the additional diagnosis of preëclamptic toxemia and with a blood pressure of 260/160 died of cardiac failure on the third day.

One patient entered in labor, badly decompensated and rapidly growing worse. Abdominal hysterotomy under morphin, scopolamin and local anesthesia was done because it seemed to offer the only possible chance of bringing the patient through alive, but death occurred in twenty-four hours from cardiac failure.

Cardiorenal Disease.—Two patients with cardiorenal disease were thus delivered with no deaths.

Of the nineteen patients in whom the heart was affected, four died, a mortality of 21 per cent. If we deduct the case that died of pulmonary embolus on the seventh day as not being directly due to the condition for which the operation was undertaken, we have a mortality from heart disease of 15.8 per cent. Since all these patients were extremely bad surgical risks we feel that our mortality would have been higher had we adopted any other method of delivery.

No further deaths occurred in the remaining twelve cases, which were operated on for the following indications: Nephritis, 2 cases; pulmonary tuberculosis, 3 cases; diabetes, 2 cases; one of whom had previously had a cesarean section.

Other Indications.—Three cases remain, all of whom had previously been delivered by cesarean section. One had acute bronchitis and was in labor, the second bronchial asthma and the third requested this method to avoid the discomfort of general anesthesia.

1. Abdominal hysterotomy offers a method of emptying the uterus easily and rapidly in those cases where such a procedure is demanded.

2. Local anesthesia under morphin and scopolamin narcrosis is superior to general anesthesia because any possible danger from an inhalation anesthetic is eliminated and operative shock is reduced to a minimum.

3. This method is, therefore, applicable to patients classed as bad surgical risks. Among such are cardiacs with previous decompensation, nephritics, diabetics, the pulmonary tubercular, or those who have acute respiratory infections upon whom it is necessary for other reasons to perform cesarean section.

De Lee,⁸⁸ in an article describing his method of performing the low or cervical cesarean section under local anesthesia, stated that at the Chicago Lying-In Hospital five operators had performed 67 laparotrachelotomies under local anesthesia alone or aided with a little ether or gas.

He does not give morphin or any other narcotic before the delivery of the baby as he has found many children are narcotized and require prolonged efforts at resuscitation.

He uses 0.5 per cent novocain to each ounce of which two drops of 1:1000 adrenalin are added, after it is sterilized. He insists on making the patient comfortable on the table, such as padding the back and shoulders with pillows, as many women complain more of the strained posture than of the pain of the operation.

He first infiltrates the skin, keeping the needle moving to avoid injecting in a vein. After the skin is benumbed, a little novocain is injected into the fat, but this tissue is not sensitive except near the pubis. The skin and fat are incised. With a short needle the solution is injected just under the fascia using more of it near the pubis; the anesthetic must be injected slowly into the fascia itself. After a few minutes the fascia is opened with a knife. Now the fascia is lifted up and 5 c.c. of the solution is deposited near the outer border of the rectus muscle on each side and in three places. The terminal intercostal nerves enter the rectus sheath here and by benumbing them the parietal peritoneum is desensitized. He also injects some more solution under the peritoneum itself, for a distance of 6 cm. on either side of the proposed opening and into the cavity of Retzius. The peritoneal cavity is next opened.

Next, 20 cm. of the solution are injected into the subperitoneal space of the vesico-uterine plica; with the fingers, this is worked down beneath the bladder and outward to the region of the broad ligaments.

De Lee does not desensitize the uterus unless the patient is in active labor. Then a few c.c. are injected in the line of proposed incision. If the bladder is very tender he places a few c.c. under its lowest portion.

The delivery of the child is always accompanied by a little pain. Half of the women can and do stand this pain; to the other half a little gas is administered at this stage.

After the birth of the child, three hypodermics are given—1 c.c. of pituitrin, $\frac{1}{4}$ Gr. of morphin and 1/200 Gr. of scopolamin. The placenta is delivered by traction on the cord, aided by the uterine expulsive efforts. This is done in preference to insertion of the hand, as the latter causes pain.

The technic of the operation is that described by De Lee in other articles. The surgeon must work slower and with greater gentleness, using delicate knife dissection rather than the stripping of tissues.

The indications for the 67 cesareans under local anesthesia were:

Contracted pelvis with mechanical disproportion	37	Eclampsia and threatened eclampsia (3 and 8 respectively)	11
Contracted pelvis with abnormality of mechanism	7	Heart disease	4
Placenta prævia	1	Ovarian cyst complicating labor . .	3
Abruptio placentæ	2	Diabetes and contracted pelvis . .	1
		Fracture of pelvis	1

There was no maternal mortality. One baby succumbed six hours after delivery. It was four weeks premature and autopsy showed almost complete atelectasis pulmonum. One was dead and macerated—a case of chronic nephritis.

There were 18 cases with postoperative temperature of 100.4° or over (27.7 per cent), of which cases the temperature was 101° or over in 13.

The causes of fever were:

Bronchitis	2	Mastitis	1
Pyelitis (in one the condition existed before operation)	2	Suppuration of the wound	4
Lochiometra	2	Unknown	7

De Lee gives the following summary:

1. Local anesthesia is not only possible but should be the method of choice for all cesareans including the cervical.

2. The dangers of acidosis and pneumonia are avoided.

3. The postoperative recovery is smoother and quicker than that following general anesthesia.

4. We are permitted through this added safety to extend the indications for abdominal delivery in border-line cases.

5. In heart, respiratory, kidney and liver cases, it is particularly valuable, indeed almost indispensable.

6. If the surgeon will devote a little time to perfecting the technic he will be able to apply it in an increasing number of conditions with increasing benefit to his patients and satisfaction to himself.

McCormick⁸⁹ recommended the performance of cesarean section under local anesthesia for the following conditions: Cardiac disease, nephritis, cardiorenal disease, eclamptic primiparæ with rigid cervixes, diabetes, pulmonary tuberculosis, bronchial asthma, marked anemia, acute infections, such as bronchitis, pneumonia, typhoid, etc., abruptio placentæ, placenta prævia accompanied by profuse hemorrhage; ruptured uterus and exophthalmic goiter.

He quoted the papers of Irving and De Lee in his article. He gives preliminary morphin and scopolamin, as does Irving, and uses 0.5 per cent novocain. He makes the following statement: "Here Dr. Gudell has again recently come to our assistance by informing us that we no longer need greatly fear drug asphyxia of the baby, so long as we have a supply of carbon-dioxide at hand." He does the classical cesarean through a low abdominal incision and

does not inject the uterus. He claims an easier convalescence and feels that local anesthesia is not used enough.

Mowery⁹⁰ reported 3 cases of classical cesarean section under local anesthesia and stated the advantages of the method as follows:

First, it is free from danger, for both mother and child. Second, there is no post-operative nausea and vomiting, the abdominal muscles remain quiet, consequently the mother is decidedly more comfortable. Third, shock is absolutely prevented. Fourth, acidosis, fatty degeneration, post-operative pneumonia and paralytic ileus are not produced or even approached. Therefore, the patient's resistance is reserved and the effects of any infection which may have been introduced during or preceding operation are greatly reduced. Fifth, there is no danger of producing cerebral hemorrhage or emboli. Sixth, in complicated cases which are already taxing the patient's resistance to its capacity, as renal insufficiency with albumin, casts, and high blood pressure, profuse hemorrhage, organic heart disease, chronic infection, exophthalmic goiter, etc., in which inhalation anesthesia is decidedly hazardous if not absolutely prohibitive, local anesthesia is used with safety, the patient returning from the operating room without any perceptible change in her general condition.

The disadvantages are few. There may be a little pain while the uterus is being delivered, but not as much during the entire operation as is occasioned by one good labor pain. The time required is a trifle longer, but the condition of the patient remains the same throughout the operation and time is not a factor, as the entire operation seldom requires over 25 to 30 minutes. Perhaps the most objectionable feature is the dread the patient or her relative may have of an operation while conscious. A little properly directed persuasion will usually overcome this. Now if in local anesthesia we have a method comparatively free from objections whereby we can safely operate desperate cases, why, then, is it not logical to extend its application and advocate a more general use of this improved method?

Waldstein⁹¹ summarized his article by saying that by fixing the uterus before incision it is possible on the one hand to block off the abdominal wound, and so prevent the leakage of liquor amnii into the abdominal cavity, also to prevent a possible protrusion of intestines in the region of the wound, and on the other hand to prevent or restrict traction on the ligaments of the uterus. By this means it is possible to keep the uterus in position and so perform the operation painlessly under local anesthesia. Summarizing briefly, he most warmly recommends and advises local anesthesia with temporary fixation of the uterus, as the method of choice in the performance of classical cesarean section. His article contains two case reports.

Keller⁹² concluded, in an article entitled "Narco Local Anesthesia in Cesarean Section," that the strain of labor may be lessened without greatly increasing the risk to the patient, by performing narco local cesarean for certain constitutional conditions (chronic endocarditis, chronic pulmonary tuberculosis, acute bronchitis with prolonged gestation, pyelitis with infection of the kidneys, hyperthyroidism, influenza, etc.). Narco local is much safer than ether in most of such conditions.

Frey⁹³ wrote that, on account of the bad effects often observed after general anesthesia in connection with cesarean section, he as well as a number of other surgeons, has tried local anesthesia with good results.

Since October, 1920, his clinic has used local anesthesia in all cases of abdominal cesarean section except in those cases involving eclampsia. In this clinic, local anesthesia is accomplished, especially in patients having cardiac disturbances, not with a combination of morphin and novocain but with novocain alone. If, in preparation, one wishes to use a central sedative, somniferin is recommended.

In the summary, he said: "By the use of this technic of local anesthesia, abdominal cesarean section may be performed, either by longitudinal or transverse incision, with local anesthesia in the anterior wall of the abdomen. This will prevent deaths caused by anesthesia."

The reviewer has personally performed 10 abdominal cesarean sections under local anesthesia, 5 of the classical type through a suprapubic incision and 5 low cervical operations. In the classical sections he used the Irving method, while in the low cervical ones he used a combination of the Irving and De Lee technics. In addition he always injected the round ligaments before separating the peritoneal flaps. One gravida had two cervical sections under local anesthesia.

For the cases in which the classical section was performed, the indications were the following: Mitral stenosis and regurgitation with decompensation, 2; pulmonary tuberculosis and a previous classical cesarean section, 1; toxemia of pregnancy and influenza, 1; toxemia of pregnancy and lobar pneumonia, 1. Four of these women were at full term while the other had reached eight and one-half months of pregnancy. Two mothers died, a maternal mortality of 40 per cent. The patient who had toxemia of pregnancy and influenza died five weeks after operation of pyonephrosis, the other delivered because of toxemia of pregnancy and extensive lobar pneumonia succumbed six hours after operation. These women were desperately ill and he doubts if they would have survived any other method of delivery. One infant was macerated; the four children born alive all survived.

The indications in the 5 deliveries by the low or cervical cesarean section were: Congenital pulmonary stenosis and decompensation, 2 operations on the same patient; mitral stenosis and regurgitation with decompensation, 3. One mother died, a maternal mortality of 20 per cent; this gravida was admitted to the hospital in a state of decompensation, her heart was fibrillating, and she was cyanotic. She had disregarded all instructions as to rest and was out shopping the day before delivery. She left the operating room in no worse condition than she was when she came to it, but died of acute cardiac dilatation six hours after delivery. The 5 babies lived. The combined maternal mortality for the two series was 30 per cent. High as this may seem, the reviewer is convinced that it would have been still higher had these women been delivered by other methods.

PORRO'S CESAREAN SECTION OR CESAREAN SECTION FOLLOWED BY HYSTERECTOMY

Casper ⁹⁴ reported the case of a primipara who came to the hospital, after ineffectual attempts at delivery by forceps, with the diagnosis of bony prominence of the sacrum and narrowed anteroposterior diameter. The patient was in fair condition. A Porro cesarean section was performed. Both mother and child left the hospital well.

Countryman ⁹⁵ described the following case: Miss O., aged 28, was admitted to the Deaconess Hospital (Grafton, N. D.) March 19, 1923, having been in labor eighteen hours, with pains on admission at five-minute intervals, and resembling those of a well advanced second stage. On routine examination it was apparent that an abnormality existed, but the patient was so unruly that an anesthetic was necessary to determine the condition present.

The external genital organs had the appearance of virginity, the labia majora were normal, and the space between was covered with mucous membrane. The urethral orifice was markedly dilated, easily admitting the index finger to the interior of the bladder. No vaginal outlet could at that time be determined, and it was supposed that the vagina opened into the bladder.

By rectal examination the head could be felt well down in the pelvis and the cervix about two-thirds dilated.

A cesarean section with hysterectomy was the only solution of the problem, the latter being necessary as there could otherwise be no provision made for the discharge of the lochia. The operation was completed with no shock to the patient. The hysterectomy was a little more difficult than usual on account of the increased vascularity of the broad ligaments. The child weighed 7 pounds, 8 ounces (3.5 Kg.), was normal and vigorous, and appeared to be of full term. During the operation, when the uterus was removed, the vaginal canal could be readily determined as normal in its upper portion, but ended abruptly with no outlet. On further examination the day following operation, a bloody discharge was noticed coming from the urethra, and, by careful sponging, two small outlets were found opening on the sides of the urethral orifice, each having the diameter of a small probe, and being about 5 cm. in length, opening into the blind vaginal pouch.

The operation was followed by a smooth convalescence. Lactation was established and maintained as usual.

The patient gave a history of menstruation having been established at 15 years of age. The periods were regular and normal, and she apparently had no knowledge of any abnormality.

This case is also of interest from a medicolegal point of view on account of the fact that pregnancy took place from spermatozoa deposited at the urethral orifice, and in spite of the fact that a sinus of 5 cm. intervened between that point and the vaginal pouch.

Spencer ⁹⁶ reported a case of a primigravida, aged 28, delivered by cesarean section followed by hysterectomy for infected myoma, using Doyen's technic. Perfect recovery of the mother and of a female child, weighing 9 pounds,

10½ ounces. A culture of one myoma gave a mixed growth of *Staphylococcus albus* and a diphtheroid bacillus.

Spencer has operated by cesarean and hysterectomy for myoma in 7 cases. All the 7 mothers recovered, and all the children survived. The first case was subtotal, the last 6 total. He is an advocate of total rather than subtotal hysterectomy no matter what the indication. He mentions the danger of malignant disease of the cervical stump. He has seen 6 such examples, and states that Fletcher Shaw had had 3 cases of cancer of the cervical stump in eighteen months.

Donovan⁹⁷ reported the case of a patient, 43 years of age, who had a contracted pelvis, an occipitoposterior position and fibroids. The cesarean section was necessary because of the contracted pelvis; and because of her age and the presence of the fibroids, it was deemed best to remove the uterus. Both mother and baby lived.

Guérin, Valmale and Dias⁹⁸ reported a case which demonstrates once more that spontaneous deliveries do not take place in the presence of osseous dystocia. It is an example of an obstruction caused more by a false sacral promontory than by the promontory itself. The cesarean followed by hysterectomy was performed two days after the rupture of the membranes and after repeated manipulations and two forceps applications. Both mother and child were discharged from the hospital in good health.

Guérin, Valmale and Raybaud⁹⁹ related the case of a secundipara, 34 years of age, whose first child had been born dead. She was admitted to the hospital in coma, suffering from eclampsia. Cesarean section with subtotal hysterectomy was performed, as there had been repeated manipulations under very doubtful conditions. The child, who was syphilitic, died, but the mother recovered.

Levant and Portes¹⁰⁰ operated on a primipara who had a normal pregnancy. At labor it was found that a septum obliterated the internal os, except for a small opening which admitted the tip of the finger. Delivery of the child, presenting by the breech, was accomplished by cesarean section followed by hysterectomy. Histologically the septum consisted of smooth muscle-fibers; no epithelium was found. The mother and child lived after the operation.

Paucot and Paquet¹⁰¹ described the case of a woman having Basedow's disease and multiple fibroids, one of which was large and in a position which caused obstruction to labor and premature rupture of the membranes. They performed a cesarean section followed by hysterectomy. The patient made an uneventful recovery.

Picard¹⁰² reported a case of cesarean section followed by hysterectomy in a woman with a contracted pelvis at a time when she was severely infected. Both the mother and child recovered.

Rivière and Lacoutre¹⁰³ stated that they believed that obstetrical surgery ought to be practiced along conservative lines when possible. In the presence of an intramural myoma, everything should be done to enucleate it and preserve the uterus. However, in the case of their patient, a primipara, 23 years old, weakened by the hemorrhages of a placenta prævia, and because of that,

more or less predisposed to postoperative infection, it seemed wiser to remove the uterus. The mother and child lived.

Essen-Möller¹⁰ asked, "Is Porro's operation still justifiable?" and stated that the scope of this operation became limited to the infected cases, and it may seem that its rôle was altogether finished, with the introduction of the cervical cesarean section. Yet, such a view seems to be overhasty. Vaginal atresia and extreme stenosis respectively demand the removal of the uterus, if one wants to be sure of avoiding stagnation of the discharge. The obstructing myomata may likewise necessitate an extirpation of the uterus.

Concerning the infected cases, one can also call in question whether in some cases Porro's operation does not give the mother a better chance than a cervical section. For instance, it is difficult to understand why the 44-year-old primipara in his case No. 32 should be exposed to the risk of having her clinical progress complicated by infection only for reasons of principle, when one could most certainly save her from this risk by removing an organ which very soon would be undergoing its senile involution.

It is a much more delicate task to decide whether it is justifiable to perform the same operation on a young woman. Surely, there can be only one opinion that this is nowadays not the proper operation in the case of a primipara, who, therefore, has no living children before and who may lose the one she has got through the cesarean section. But Essen-Möller is not quite as certain that the operation would be inappropriate in the case of a multipara, if one thinks the risk of infection is great, or if another pregnancy is precluded, because of the mother having some disease or other. He is not prepared to express a positive opinion on this point, but states that he should not regard it as a rejectable step, if it has received the careful consideration of an experienced man. For, however good results may have been advanced in favor of the cervical cesarean section, it has nevertheless caused one or two deaths through infection, even though it has been performed by master hands, and the question is whether the mother would not have stood a better chance in such cases, had Porro's operation been resorted to.

Harris¹⁰⁵ referred to a recent statistical report by Eardley Holland on 4197 cesarean sections, which were done in Great Britain and Ireland from 1911 to 1920. In the series there were 46 cesarean sections which had been terminated by supravaginal hysterectomy with 8 deaths, a percentage of 17.4 per cent. As this is far in excess of the mortality in his service, it seemed that it might be interesting to study the results which he has obtained and to compare them with those reported by Holland.

From the early days of Harris' service it was noted that the convalescence following supravaginal amputation was more satisfactory and much smoother than that following most conservative sections, with the result that he gradually came to employ the former operation whenever it seemed justifiable, more particularly in two classes of cases: First, as the method of choice for effecting sterilization after repeated cesarean section, and second, as a means of obtaining more ideal results upon patients who were already infected or who were admitted to the service after being long in labor.

In the earlier days of the service many conservative cesarean sections were done in the second stage or late in the first stage, with the idea that the patient should be given a test of labor in order to ascertain whether the head would or would not engage. They gradually learned that this was an erroneous practice and resulted in a relatively high mortality. After this, the performance of conservative cesarean section was limited practically to such patients as could be operated upon at an appointed time before the onset of labor or as soon as possible after the appearance of labor pains; while in the patients who were seen late in labor or who already presented signs of infection, he either did not do a cesarean at all or removed the uterus after its performance. Some idea of the improvement of the results which followed may be gained from the fact that in the first 50 cesarean sections done in the service the mortality was 12 per cent, while in the following 173 operations done up to May 15, 1922, it became reduced to 2.88 per cent.

In 223 cesarean sections which have been done in the obstetrical service of the Johns Hopkins Hospital up to May 15, 1922, the uterus was removed by supravaginal hysterectomy in 64 instances. For purposes of study the 64 cases have been divided into two main groups, the first including all patients from whom the uterus was removed at the first cesarean section, and the second those from whom it was removed at the second or third section, as shown in Tables I and II.

TABLE I.—SUPRAVAGINAL HYSTERECTOMY AT FIRST CESAREAN SECTION

Late in labor or manifest infection	10
Sterilization	5
Heart disease	5
Atresia of cervix	5
Neglected transverse presentation	4
Myoma of cervix	3
Hour-glass contraction of uterus	2
Apoplexy of uterus	2
Failure of bag or bougie	2
Uncontrollable hemorrhage	2
Dystocia following ventral fixation	1
TOTAL	41

TABLE II.—SUPRAVAGINAL HYSTERECTOMY AT REPEATED CESAREAN SECTION

Late in labor or manifest infection	8
Sterilization	13
Tearing of uterine incision	1
Blocking of outlet by condyloma	1
TOTAL	23

In the 64 patients there were 3 deaths, a gross mortality of 4.68 per cent, which is, roughly speaking, only one-quarter as great as that reported by Holland. None of the deaths was due to infection and only one of them was associated directly with the operation. The latter occurred at a second section upon a multiparous patient with a generally contracted pelvis, from whom the uterus was removed for the purpose of effecting sterilization. Owing to inexperience the operator had difficulty in ligating the left uterine artery, with the result that death from hemorrhage occurred on the operating table. The other 2 deaths are covered by complete case reports which show that one death occurred eight days after operation from acute thrombo-endocarditis with perforation of the aortic valves, and the other occurred shortly after operation, due to a preëxisting renal condition, which had become accentuated by a premature separation of the placenta.

These 3 deaths represent a mortality of 4.68 per cent, but, as has been indicated, only 1.56 per cent could in any way be attributed to the operation. These figures indicate that those of Holland give a distorted picture of the dangers following supravaginal hysterectomy, and indicate that the results obtained in Harris's hands are essentially as satisfactory as in elective conservative sections done at an appointed time before the onset of labor or within the few hours following the appearance of uterine contractions. This is particularly emphasized when one considers that a large portion of these cases, when first seen, exhibited a condition such as to suggest that infection had already occurred.

In this connection it is interesting to ascertain whether the uterus has been unnecessarily sacrificed, thereby ending the reproductive career of the patients. This can be answered only by studying the cases in somewhat closer detail, and the verdict will depend in great part upon one's point of view. As is evident from Tables I and II, the uterus was removed from 18 patients solely for the purpose of effecting sterilization. Five of such operations were done at the first and 13 at a subsequent section.

Whether the removal of the uterus in such cases was indicated depends altogether upon one's point of view; first, concerning the justifiability of sterilization in general, and second, upon whether it can best be accomplished by removing the uterus. Of course, it can be effected in one of two ways, either by doubly ligating the tubes and burying the proximal ends between the folds of the broad ligaments, or by removing the uterus. If the patient, on being questioned, states that she does not desire to menstruate after the operation, the uterus is amputated as the easiest and most satisfactory method of attaining the desired end. In addition to these 18 cases, the uterus was removed from 5 other women suffering with serious heart disease, as it was felt that in their cases sterilization should follow the first cesarean.

Thus, there are 23 patients in whom the prime or secondary object of the hysterectomy was sterilization, leaving 41 on whom it was performed for other indications. Eighteen of these were done frankly on account of the patient coming into the service already infected or late in labor. In addition to these, the uterus was removed on account of atresia of the cervix, in 5

instances, neglected transverse presentation in 4 instances, hourglass contraction of the uterus in 2 instances, failure of the bag or bougie to bring about labor in 2 other instances and dystocia following ventral fixation of the uterus in one instance—a total of 32 cases. With the exception of the cases of atresia of the cervix, all of these 32 patients were operated upon late in labor and after they had been examined frequently by the vagina, and sometimes subjected to unsuccessful attempts at delivery by other methods. In several of the cases of atresia of the cervix the patient had a high temperature at the time of admission, and it was felt that a satisfactory result could be obtained only by the removal of the organ. Adding these cases to those in which sterilization was the prime indication, we find that they aggregate 55 in number, leaving 9 others in which the operation was done for some other cause.

The justification for removing the uterus in the former group of cases lies in two considerations: First, the only death which occurred was an operative accident, as compared with the 9.4 and 26.5 per cent mortality following conservative cesarean section performed late in labor or after attempts at delivery, as shown by Holland's statistics. Furthermore, as shown in Table III, 60 of the uteri amputated were subjected to histological study and in 23 of them definite histological evidence of ascending infection was found in the shape of leukocytic infiltration or actual inflammatory reaction in the mucosa of the cervix and lower uterine segment. Moreover, in many specimens the presence of bacteria could be demonstrated by suitable bacterial stains. On the other hand, in the 27 patients from whom the uterus was amputated at an appointed time at the end of pregnancy or within six hours after the onset of labor, signs of infection were present in only one, whereas in the 28 patients who were operated upon late in the first stage or during the second stage of labor, 18 presented histological evidence of infection.

TABLE III.—HISTOLOGICAL STUDY OF AMPUTATED UTERI

Duration of Labor	Total Specimens	Inflammatory Changes	Percentage
Before or within 6 hours of onset	27	1	3.7
6 to 18 hours	5	4	80.0
Late 1st or 2nd stage	28	18	64.3
TOTAL	60	23	38.3

While it is not Harris's intention to contend that all patients with ascending infection would necessarily do badly, it does, however, seem to him that many of them would have done so, and accordingly, he feels that he has adduced a satisfactory scientific justification for this course of procedure. Moreover, he feels confident that, had the conservative operation been done, or even one of the various types of extraperitoneal, low cervical or flap operations employed, many more of the patients would have died and there would have been results comparable to those obtained in the first fifty cases of his series, as well as with the figures given by Reynolds, Routh and Holland in late operations.

This being the case, he does not feel that the uterus was unnecessarily sacrificed, but on the contrary, he is convinced that the procedure has resulted in saving the lives of a considerable number of women who would otherwise have died.

It is generally believed that premature rupture of the membranes adds materially to the danger of operation, in that it favors ascending infection. In general this is doubtless true, but this material serves to show that ascending infection may be present without its occurrence, as on examination of the history of the patients, in whose uteri histological evidence of ascending infection was present, it was found that the membranes were intact in 9. On the other hand, in the 11 patients from whom the uterus was removed after labor had been in progress for six hours or more, and in which histological examination shows the absence of ascending infection, it was found that the membranes had ruptured in 7 and were intact in 4 instances. While such figures clearly indicate that premature rupture of the membranes does increase the danger of infection, they likewise indicate that the main factor concerned is the actual length of labor, and that whenever it has lasted for more than six hours the probability of ascending infection must always be considered and will increase with every additional hour the labor has lasted.

Furthermore, it is generally admitted that a temperature of 100.4° F. or more during labor raises the presumption of intrapartum infection. Upon studying the material with this in mind, it was found that 9 of the 64 patients presented elevations of the intrapartum temperature. The uterus from 5 of these presented signs of ascending infection, while in the other four it did not. To put it in another way, it might be stated that, in the 23 uteri which presented histological evidence of ascending infection, the condition was preceded by intrapartum fever in only 5 instances. In other words, the infection was preceded by elevation of temperature only in 5 out of 23 instances. Accordingly, we may conclude that, while the occurrence of intrapartum fever raises the presumption of ascending infection, its absence by no means indicates that it has not already occurred. Here again we must draw a conclusion similar to that in connection with premature rupture of the membranes; namely, that the great danger arises from the prolongation of labor rather than from any of the factors upon whose occurrence we have in the past laid much weight.

For these reasons, Harris has come to regard the late cesarean as an extraordinarily dangerous operation, and, in such cases, if we are not prepared to sacrifice the uterus, we must resort to pubiotomy or the destruction of the child if we wish to safeguard the patient, whereas, if we resort to radical measures, we may obtain results comparable to those following conservative cesarean section done at an elective time either before or just after the onset of labor.

Duvillier and Beghin¹⁰⁶ stated that in a parturient the membranes had been ruptured for three days and several attempts at delivery had been made before she came under their care. The shoulder was presenting and a tight Bandl ring was discovered. Version was impossible, there was the possibility of embryotomy, but the fetus was living, and its high station and the

contracted state of the uterus were contra-indications. It was considered simpler and less dangerous for the mother to perform a Porro operation, as the patient already had seven living children. The mother and child both lived.

Fournier¹⁰⁷ reported the case of a primipara operated in her home in the country. She had edema of the vulva. It was impossible to catheterize her as the urethra was flattened and pressed upon by an enormous serosanguineous mass, rolled out and stretched by the fetal head. Edema of the cervix and the lower segment was present. The pelvis was generally contracted with a false promontory. Normal delivery was impossible and resort was had to a typical Porro operation. The mother and child lived. Fournier believes that in case of long labor, where a long journey is necessary, the surgeon should go to the patient, also that the typical Porro operation carries much less shock than subtotal hysterectomy in such cases.

Schockaert¹⁰⁸ reported a cesarean section followed by total hysterectomy, for a fibroma prævia in a woman 37, who had had three normal pregnancies and labors. The mother and child recovered.

Ducaros¹⁰⁹ of Mitelin, Greece, related the history of a 20-year-old primipara at term and with albuminuria. At 10 A.M. she had convulsions and was seen by a local physician. At 4 P.M. she had severe abdominal pain. The patient was pale, the uterus had a ligneous consistency. A diagnosis of premature detachment of the placenta was made. Twenty-four hours later she was seen by Ducaros. Her condition had become worse, her pulse was 135. Intense thirst, woody consistency of the uterus, and anemia existed. Vaginal examination showed a long cervix, no dilatation and the presenting part high. Laparotomy was done. The uterus was distended, discolored, ecchymotic; in other words, the anatomical picture of uterine apoplexy so well described by Couvelaire. On opening the uterus, liquid and clotted blood under enormous tension was found. The child was dead. Operation was terminated by the Porro amputation. The patient recovered.

Audebert and Fournier¹¹⁰ reported 3 Porro operations:

Case I.—The patient's membranes ruptured before the onset of labor which had lasted over twenty-four hours before her admission to the hospital. The fetal head was overriding the pubis. The cervix was fully dilated, meconium was being passed freely. There were a large caput, marked vulval erythema with considerable yellowish green discharge, endocervicitis and vaginitis and a contracted pelvis. Delivery by the natural passages was impossible. In the presence of this state of infection, a cesarean section followed by the ablation of the uterus was practiced (typical Porro operation). A large drain was introduced in the culdesac of Douglas. The child was resuscitated with considerable difficulty and weighed 3310 Gm. Complications of the puerperium were, persistent suppuration of the cervical stump for two months and an abundant vaginal discharge for several months. The patient finally recovered.

Case II.—A secundipara 26 years old. Previous classical cesarean section for contracted pelvis and cephalopelvic disproportion. The child died on the eighteenth day of bronchopneumonia. Second operation: Because of intense

adhesions which had to be freed the uterus was left in such condition that it would have been unsafe for another pregnancy to occur. For this reason it was removed by the Porro operation. The recovery was satisfactory and the puerpera left the hospital on the thirtieth day. The child at birth weighed 3180 Gm.

Case III concerned a secundiparous rachitic dwarf with marked deformity of the lower limbs and who had had a previous classical cesarean section. At the second cesarean section, extensive adhesions were found. After freeing these a subtotal hysterectomy was performed, because it was impossible to follow Porro's technic; the child weighed 2800 Gm. The convalescence was normal except for a few attacks of cardiac insufficiency which disappeared under the influence of digitalin.

Guéniot ¹¹¹ reported 2 cases of shoulder presentation treated by cesarean section followed by supravaginal hysterectomy:

Case I.—A secundipara. External version was attempted twice at the end of gestation without success; when first seen by Guéniot, the cervix was fully dilated, the membranes ruptured, and an attempt at internal podalic version had been made. A foot had been brought down but it had been impossible to turn the fetus. By this time the child was dead. The cord was prolapsed, the one foot which was outside of the vagina, together with a tight contraction ring which was present, made it impossible to introduce the hand in the uterus to do an embryotomy. Cesarean section followed by a subtotal hysterectomy with abdominal drainage was performed. She had an attack of epilepsy the same evening. The convalescence was satisfactory; there was slight elevation of temperature the first few days; it became normal on the sixth day. Slight local suppuration with secondary elimination of catgut sutures occurred. She recovered.

Case II.—The patient, a para XII, was admitted with ruptured membranes, for more than a day and a half. Shoulder presentation, one hand protruding from the vulva. All signs of infection were present. Unsuccessful attempt at embryotomy. The extruded arm was removed with scissors. Cesarean section followed by supravaginal hysterectomy. Mikulicz's drain. Early convalescence was fairly satisfactory, but she died on the sixth day. The autopsy showed peritonitis.

The reviewer's series of cesarean sections followed by hysterectomy contains 14 cases. In one of them a total hysterectomy, and in the 13 others a subtotal hysterectomy were performed for the following indications:

Mismanaged labor and frank infection..	8
Uterine apoplexy	1
Uterine myomata	1
Uncontrollable hemorrhage	4

All the mothers recovered. There were two stillborn children, who were dead before the operation was undertaken. Of the twelve children born alive one died on the fifth day of hemophilia and infection.

CESAREAN SECTION FOLLOWED BY TEMPORARY EXTERIORIZATION OF THE UTERUS

The Portes Operation

Cesarean section followed by temporary exteriorization of the uterus was first done by Louis Portes at the Maternité de Port Royal de Paris, on the service of Demelin, December 14, 1923. The first case was reported to the Société d'Obstétrique et de Gynécologie de Paris, at its meeting of March 10, 1924. Since the first case was reported a number of these operations have been done in France. See Literature Nos. 112 to 123 inclusive.

The method does not enter into competition with the conservative cesarean section, be it classical or low cervical, but it is of value in neglected cases in which it would be hazardous to undertake the latter methods. It, therefore, is never considered in clean or relatively clean cases. The low or cervical cesarean section has its greatest advantages in the clean or the presumably infected case, but does not offer the same degree of safety that does the Portes operation in the frankly infected or hopelessly neglected case in which an indication for abdominal delivery arises. It is therefore never an operation of choice but one of necessity.

Its largest field of usefulness is represented under four conditions:

1. When frank infection is present, the child is living, and the condition of the pelvis is such that abdominal delivery is indicated.
2. In the presence of infection and of a dead child when delivery by the natural passage, if not impossible, is at least fraught with danger.
3. When any maneuver through the birth canal might result in the rupture of the uterus. The operation is indicated in such a case even though the child is dead. This applies especially in the neglected labor case with marked uterine retraction. In this type of case it is safer than craniotomy on a dead child, or even embryotomy, as either of these procedures performed within a retracted uterus may well lead to rupture.
4. In the presence of a pelvic indication for abdominal delivery with fetal putrefaction and grave maternal infection.

It is a known fact that a woman subjected to long labor and repeated attempts at delivery is a poor risk for an extensive abdominal operation; and yet most authors agree that in that type of case the cesarean section should be followed by hysterectomy because of the greater safety afforded by this procedure. The hysterectomy is often done at the worst possible time, the patient being in a state of shock. In surgery the poor risk is more and more frequently being operated on in two stages, and there is no reason why the obstetrical patient should not receive the benefit of this advance in surgery.

The Portes operation, the technic of which follows, is done in two stages. The first stage consists in making a long abdominal incision, delivering the pregnant uterus, closing the abdominal wall behind it to the cervix, making a high uterine incision, extracting the child, placenta and membranes, closing

the uterine incision and allowing the uterus to remain on the abdomen. This part of the operation is rapid and results in but little shock.

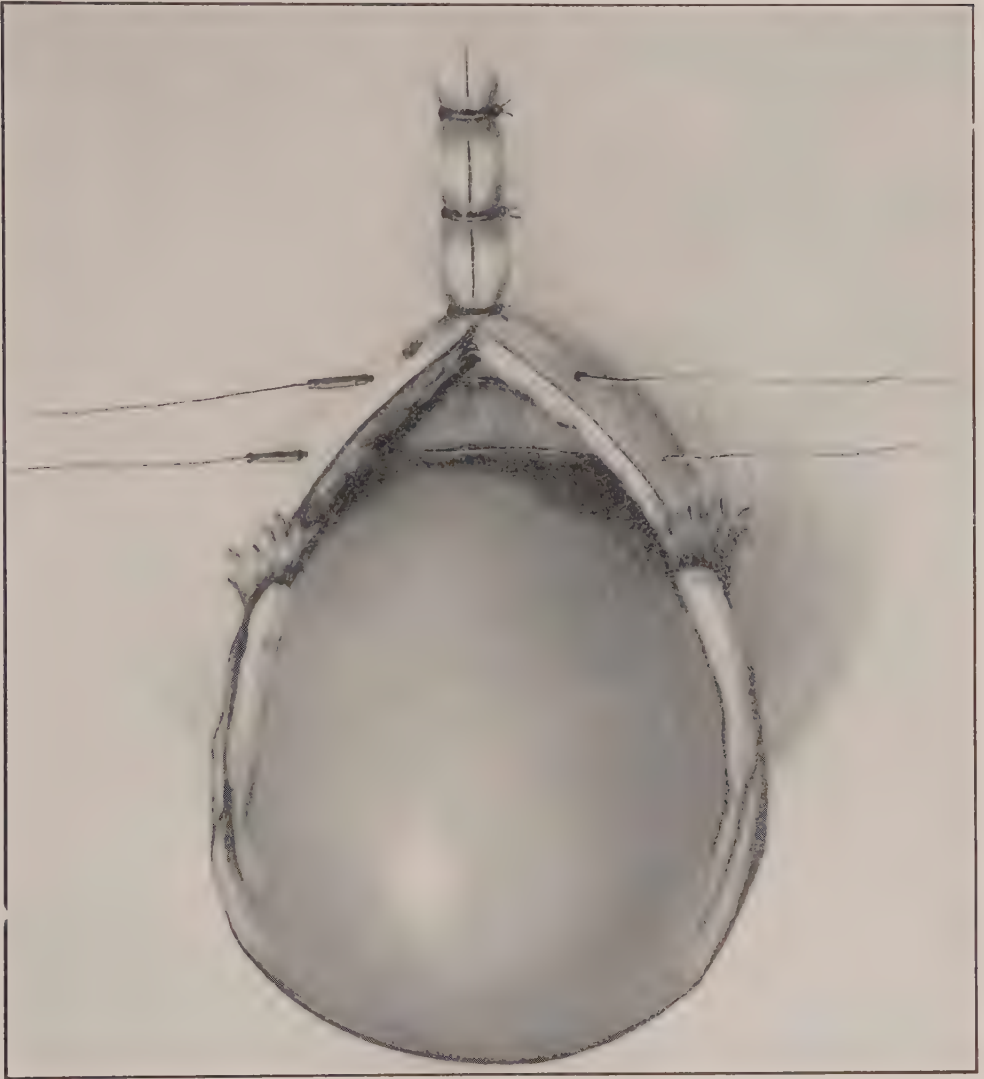


FIG. 54.—PORTES OPERATION.

Median abdominal incision from symphysis to near xiphoid cartilage. The pregnant uterus is strongly anteverted to permit the rapid suturing of the abdominal wall. The sutured abdominal wall is covered with sterile towels; the uterus is dropped on it; gauze wicks are placed around the lower segment and an incision on the anterior uterine wall, encroaching on the fundus, is made. The fetus, placenta and membranes are extracted and the uterine incision is closed in two layers with No. 2 chromic catgut. The uterus is covered with a moist sterile dressing and a tight abdominal binder is applied.

As far as the second stage is concerned, two methods may be used: First, if the patient does well, involution of the uterus is allowed to take place, and when the uterus is clean and the uterine incision well healed, the abdominal

incision is reopened and the uterus and adnexa are replaced in the pelvic cavity. Drainage is placed behind the uterus, and the abdominal wall is closed. If, on

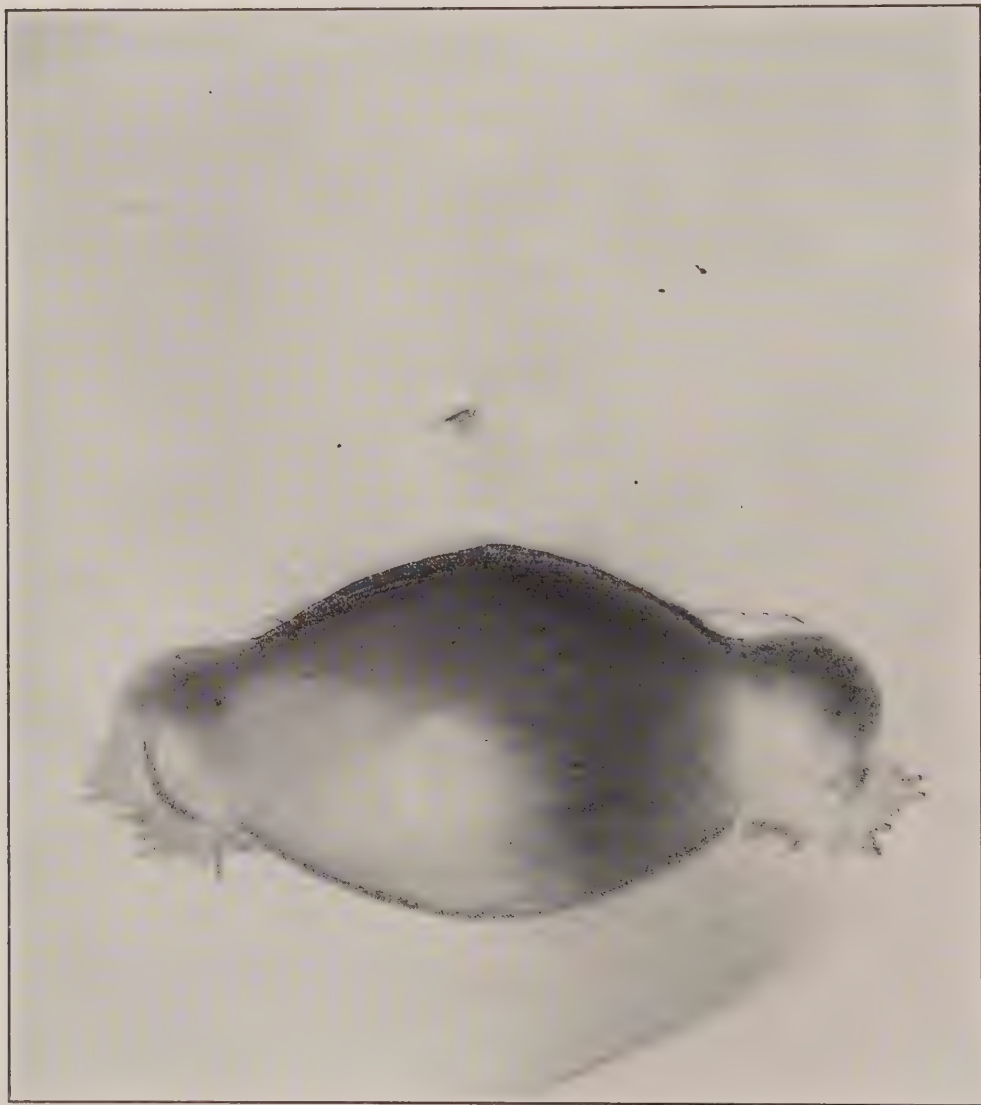


FIG. 55.—PORTES OPERATION

The uterus after involution has taken place and before it is returned to the pelvic cavity. The uterine scar is hardly visible. The abdominal incision is perfectly healed. The tubes and ovaries are slightly edematous but the tubes are patent.

the other hand, the sepsis seems uncontrollable, a hysterectomy may be performed, extra-abdominally, following the Porro technic, after the state of shock has passed. This was done successfully in one case with the patient in bed, without anesthesia. At the February 9, 1925, meeting of the Société d'Obstétrique et de Gynécologie de Paris, A. Couvelaire stated that he knew

of 32 cases in which the Portes operation had been performed and the uterus returned to the pelvic cavity, with 2 deaths or a mortality of 6.2 per cent.



FIG. 56.—PORTES OPERATION

The abdominal incision is reopened; the intestines are protected with gauze. Intestinal adhesions are exceptional.

This mortality is extremely low if one considers the fact that these were cases of frank infection.

All these women who recovered saw the return of their menstrual function and resumed their duties with comfort. At first the obstetrical future of these



FIG. 57.—PORTES OPERATION

The adhesions to the uterovaginal pedicle are, at first, separated with scissors and then with the finger until the pedicle is free from the abdominal wall. The uterus and the adnexa are dropped in the pelvic cavity where they assume their normal positions.

patients was naturally questioned, but it has been proved that a woman with a uterus which has been exteriorized and returned to the pelvic cavity may conceive and carry a pregnancy to term, as shown by the following observation:

At the July 5, 1926, meeting of the Société d'Obstétrique et de Gynécologie

de Paris, A. Couvelaire reported the case of a woman having previously been delivered by the Portes operation, who successfully carried a pregnancy to term. The Portes operation was performed on July 18, 1924, and the parturient was delivered of a male child weighing 7.4 pounds (3430 Gm.). The

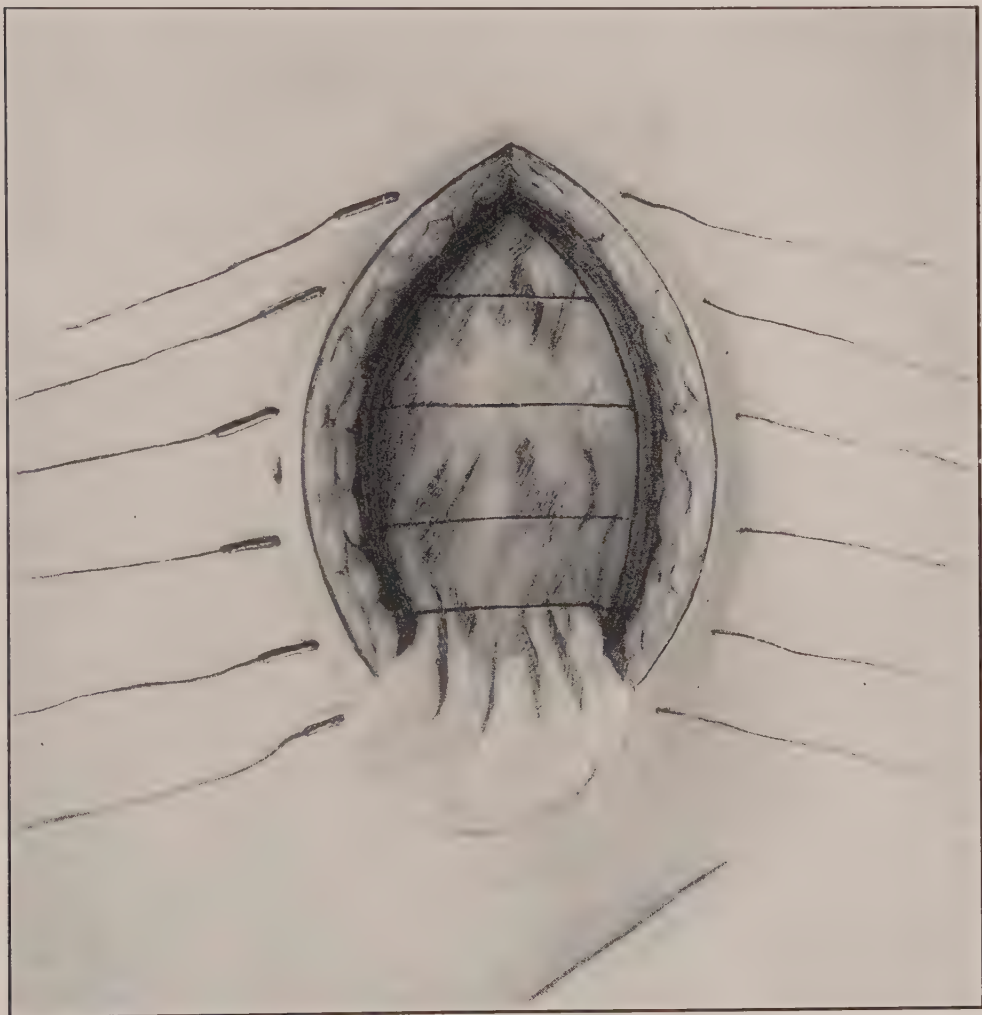


FIG. 58.—PORTES OPERATION

Through and through sutures of silkworm gut booted with fine rubber tubing are introduced. A cigarette drain is placed in the culdesac of Douglas and comes out behind the uterus. The gauze is withdrawn, the omentum is brought down and the sutures tied.

uterus was returned to the abdominal cavity on August 2, 1924, it having been extruded for fifteen days. She left the maternity hospital on August 16, 1924, with her child, and resumed her occupation of housewife. The second pregnancy evolved normally. She started in labor late on July 4, 1926, and early on July 5, 1926, she was delivered at the Baudelocque Clinic, by Portes, by

a classical cesarean section. The child was alive and weighed 7.1 pounds (3250 Gm.). There were only a few omental adhesions to the abdominal wall, the uterus was free and without adhesions, and the uterine scar was good.

The reviewer is indebted to Couvelaire and to Portes for the privilege of seeing this woman and her child at the Baudelocque Clinic, on the day of her delivery, July 5, 1926. Since the publication of the original operation of Portes, the reviewer has been able to collect the details of 17 cases from the literature.

Technic of Operation.—General anesthesia is used and the operation performed in two stages.

FIRST STAGE.—The patient is given a general anesthetic and the abdomen opened by an incision extending from slightly above the symphysis pubis to the xiphoid cartilage. The pregnant uterus is delivered, covered with sterile moist towels and turned toward the symphysis pubis. The traction on the uterus should not be too great. The abdominal wall is closed in one layer behind the uterus down to the cervix with double silkworm gut stay sutures booted with small rubber tubing. (In France they use silver or bronze wire.) The closed abdominal wall is then covered with a sterile towel; the uterus is dropped on it and wicks are carefully placed around the cervix to prevent leakage in the abdominal cavity. A high midline incision encroaching upon the fundus of the uterus is made. The low angle of the incision should not be too low so that it will not pull down in the abdominal cavity when involution of the uterus has taken place. The child, placenta, and membranes are extracted and the uterus is sutured in two layers with No. 2 chromic catgut, the first interrupted and the second continuous. (In France they use silk sutures for the deep layer.) The uterus is now covered with dressings and left on the abdomen. A tight abdominal bandage is applied to keep the uterus flat on the abdomen as its ante flexion causes pain.

SECOND STAGE.—When the uterus is clean and the uterine scar is firm, the abdominal incision is reopened up to about the umbilicus. The adhesions are freed from behind the cervix, from the uterovaginal pedicles laterally and from the abdominal wall anteriorly. The uterus is dropped back in the abdominal cavity, and a large cigarette drain introduced into the culdesac of Douglas and allowed to come out of the abdominal wall behind the uterus. The abdominal wall is again closed in one layer with double silkworm gut stay sutures.

The reviewer has performed two of these operations in the last eight months with satisfactory results. In the first case the uterus was exteriorized for forty-one days, in the second for thirty days. Both patients had had attempts at forceps in their homes before admission to the hospital. The infant in the first case was dead *in utero* when he saw her; the second child was born alive and discharged from the hospital in good condition. In both of these women the uterus was so firmly contracted that it was felt that any form of delivery through the pelvis would have resulted in a ruptured uterus.

Cesarean section with temporary exteriorization of the uterus, the Portes operation, is an operation reserved for cases in which infection is severe and

abdominal delivery indicated. The indications for this procedure are, therefore, very limited. At first thought it looks like a very radical method, and yet, in the final analysis it proves to be conservative since it permits preservation of the uterus, tubes and ovaries. The technic of the operation is very simple and can easily be carried out. In reviewing the reported cases it was found that in every case in which the uterus was replaced, the patient recovered. The uterus was left extruding from fifteen to eighty-six days. It is also possible, by this method, to remove the uterus extra-abdominally, if sepsis is uncontrollable, at a time when the patient is out of shock. One woman who had the uterus exteriorized, subsequently carried a pregnancy to term and was delivered of a living child by a classical cesarean section. The function of reproduction may, therefore, be preserved. There is very little peritoneal reaction after the pelvic organs have been returned to the abdominal cavity.

CERVICAL CESAREAN SECTION

In looking over the literature on cesarean section for the last decade one is impressed with the fact that most of the papers deal with the low or cervical cesarean section. At first, entirely extraperitoneal, as the methods of Latzko and Küstner, the operation was modified into the transperitoneal method (Veit-Fromme-Hirst) where the parietal and visceral layers of peritoneum were united to create a so-called extraperitoneal space through which delivery was accomplished, and finally evolved into the intra-abdominal flap, retrovesical operation, which is almost entirely used at the present time. Again, the incision in the cervix may be made longitudinally or transversely, and there are adherents to the two methods. It is a known fact that the low operation is replacing the classical in many important obstetrical clinics.

An impressive contribution on the subject is that of De Lee's¹²⁴ in a paper entitled "An Illustrated History of the Low or Cervical Cesarean Section." Starting with the *Lex Regia* of Numa Pompilius, 700 B.C., he follows through its numerous steps the evolution of the cesarean section up to the present cervical operation. This contribution is of interest both from an historical and from a practical operative standpoint.

The cervical operation may be of three types: (1) The true extraperitoneal section represented by the methods of Küstner and Latzko, where the cervix is cleared by lifting off the unopened peritoneal sac from the anterior portion of the inlet, the bladder and the lower uterine segment. (2) The transperitoneal section (Veit-Fromme-Hirst operation), in which a so-called extraperitoneal space is obtained by uniting the parietal and visceral layers of peritoneum. (3) The intra-abdominal retrovesical section, or the modified Sellheim method, which is now replacing the other procedures and is generally employed.

The disadvantages of the true extraperitoneal operation were that (1) the bladder and ureter were not infrequently injured with resulting fistulæ; (2) the peritoneum was occasionally opened during its separation, thus losing the advantage of the extraperitoneal method; (3) the pelvis had to be drained and

this resulted in suppuration and long drainage in many instances; (4) there was more hemorrhage, since the incision in the lower segment had to be made to the side rather than in the median line, and the technical difficulties were greater, and (5) the operation could not be repeated because of adhesions.

The transperitoneal method was the next step in evolution, and was adopted because of its greater simplicity and also because of its lessened technical difficulties.

Krönig brought a new light on the whole subject when he claimed that the better results obtained by these methods were not due to the fact that the uterus was approached in an extraperitoneal manner but because the incision was made in the thin non-contractile lower segment rather than in the thick, contractile body of the uterus. The Sellheim and Krönig operations differ only in small technical details. In these methods the abdominal cavity is protected by thorough walling off with gauze, which is simpler than uniting the peritoneal layers. The incision of the segment at the completion of the operation is entirely retroperitoneal or retrovesical. This simpler method has given results as satisfactory as the first two and has therefore largely replaced them. In this connection we must bear in mind that in the presence of a virulent infection, no conservative method offers any great degree of success, and that the best results are obtained by the removal of the infected uterus.

Cameron,¹²⁵ in an article entitled "Technic of Cesarean Section," stated that Frank's procedure of opening the uterus in its lower segment has been more extensively practiced during recent years in Germany and America with the object of abolishing rupture. Modifications of Frank's technic have been introduced from time to time, and the liability to rupture certainly seems to have been diminished, but it should be remembered that the cervical incision is seldom employed in comparison with that in the uterine body. An additional advantage in the cervical operation is that adhesions will be less apt to form. On the other hand, it is an operation for the specialist rather than the general practitioner. Cameron gives three disadvantages to the method, namely, that during extraction of the head hemorrhage may result from extensive tearing of the tissues where a transverse incision had been made, that the transverse wound should be avoided because the muscular fibers in this area are for the most part arranged longitudinally, and finally that the operation must be delayed until the patient is well in labor so as to permit sufficient stretching of the lower segment. The reviewer has not encountered any of these objections in a series of 32 low cesarean sections with the transverse cervical incision, a number of which were done before the onset of labor.

Cameron quoted statistics on 83 cases where his method of performing the cervical cesarean section was used with a maternal mortality of 3.6 per cent and stated that Beck's¹²⁶ method differs from the classical operation in that the uterus is incised in the lower segment and an extraperitoneal closure of the uterine incision is effected by utilizing two previously prepared flaps of peritoneum.

The shorter duration of the operation, ease of exposure, fewer technical difficulties, and less troublesome delivery of the child are points in favor of the

classical and may be regarded as disadvantages of Beck's method. They hardly warrant consideration, if experience continues to show that this method offers better protection against hemorrhage, peritonitis and adhesions, and is followed by earlier convalescence and less risk of rupture in subsequent pregnancies.

Welton ¹²⁷ employed the double-flap low cesarean section in 11 cases, making a transverse incision of the abdomen just above the pubes. All women were potentially infected at the time of operation. Not a single case of peritonitis occurred and the maternal mortality was nil.

He believes that the double-flap method (Beck) offers great protection against extension of infection to the peritoneum from an infected uterus. Adhesions are greatly minimized as the flaps completely peritonealize the uterine wound.

Henkel ¹²⁸ in general felt that cervical cesarean section should be the method of choice and in special cases he recommends intraperitoneal cesarean section. He recommends it because it can be used in the majority of cases without difficulty and at the same time it can be performed in a brief space of time and usually in fairly typical fashion.

Henkel says that he himself no longer performs extraperitoneal cesarean section since he is convinced that technically it is much more difficult than the intraperitoneal and that it is not possible in every case to be certain of keeping the peritoneum intact, likewise that certain collateral injuries to bladder, ureter, etc., may occur even at the hands of the most skillful surgeon. In addition to this, the operation consumes so much time under certain circumstances that the child may be endangered, and investigations concerning the spread of infection have shown that the danger of infection resulting from operation is much greater for the cellular tissue of the pelvis than for the peritoneum. The conditions of the wound are much more favorable in intraperitoneal cervical cesarean section than in the extraperitoneal. For the present, therefore, he feels that the only advantage of the purely extraperitoneal method lies in the fact that up to the present no cases of peritoneal adhesion have been observed when this procedure was used.

In the technic of cesarean section the question of resistance of the scar in cases of renewed pregnancy plays an important part. There is no danger from the suture if the wound has healed aseptically and the suture has been made correctly. Henkel defines a correct suture as one in which tissues are not mixed, *i.e.*, mucosa is sutured to mucosa, musculature to musculature, peritoneum to peritoneum. Now if peritoneum or mucous membrane is allowed to penetrate into the musculature the resistance of the scar is decidedly reduced. Therefore, surgeons must by all means avoid allowing the mucosa to enter the muscular layer in the suture of the uterus.

Krause ¹²⁹ stated that the recent publications of Vogt (Tübingen), Martinus (Bonn) and Walthard (Zurich) show more and more that the suprasymphyseal transperitoneal cesarean section is superior to the extraperitoneal. Since practical experience rather than theoretical discussion must cause the surgeon to make his decision in favor of one or the other method,

Krause has used the suprasymphyseal transperitoneal cesarean sections performed in his clinic as the basis of this article.

Since January 1, 1908, the following deliveries by cesarean section were made:

150 transperitoneal suprasymphyseal (among them 125 on account of contracted pelvis)

2 extraperitoneal (1908 and 1909)

11 classical (the last one 1910)

15 posterior cervical (Polano, last 1920)

11 Porro

2 total extirpation

In 13 primiparæ, cesarean section was not performed until it was observed, after a rather long period of labor, that the fetal head showed no tendency to enter the pelvis. Krause wishes to point out that at least a large percentage of cesarean sections performed in his clinic were not clean cases.

In 36 of the women delivered by suprasymphyseal transperitoneal cesarean section this operation or another form of cesarean section was performed the second time, in 23 of these cases a suprasymphyseal transperitoneal cesarean section with delivery of a living child had preceded, two of these children having died after four weeks and two after nine and ten minutes respectively. In 8 cases, the third cesarean section was performed on the patient, in one case there was one classical and one suprasymphyseal transperitoneal, in 2 cases a suprasymphyseal transperitoneal and one according to Polano, in 2 cases 2 according to Polano, and in 4 cases 2 suprasymphyseal transperitoneal cesarean sections had preceded. All the children were born alive and continued to thrive. One woman was subjected to the suprasymphyseal transperitoneal cesarean section four times, and all four children are alive.

In the cases of repeated cesarean section, it was possible to get a view of the adhesions occurring in the abdomen after this operation. In 13 cases there were very light adhesions, usually in the lower part of the scar in the uterus with the scar in the abdomen. Larger adhesions, some wide and some solid bands were found in 5 cases. In 2 cases slight adhesions to the omentum were found. In 12 cases not even the slightest adhesions to the omentum were found. Adhesions with the intestines or in the free abdomen were not found in any case. In most cases nothing could be seen concerning the uterine scar; in 3 cases the musculature was somewhat thin at that point. The abdominal scar was always firm, in no case was abdominal rupture observed.

Wagner,¹³⁰ writing on transperitoneal cesarean section in eclampsia felt that:

1. After indication for cesarean section has been established, it must be borne in mind that an eclamptic is a patient whose system is poisoned and who would react unfavorably to large doses of a narcotic as well as to lengthy operation. Reductions of temperature must by all means be avoided (operating table must be kept warm). The anesthetic must, therefore, be carefully administered by a skillful hand. Catheterization and shaving during narcosis.

The operation itself must be performed quickly and with a sure hand, consuming, with the author's technic, not more than twenty minutes.

2. Suture. The increased tendency toward infection in eclampsia is well known. For this reason the suture must be absolutely reliable. If infection of the uterus occurs and the suture is not firm and capable of resistance, peritonitis is unavoidable. He usually makes two continuous sutures of catgut and over them a serosa suture of silk. In case of increased danger of infection caused by repeated internal examinations, a fourth suture is made connecting the serosa of the uterus with the lateral peritoneum so that the free peritoneal cavity will not be exposed to infection if such should occur.

3. The physician himself must attend to postoperative treatment. It is necessary that he remain at the bedside for some time to watch the course of events.

Benthin,¹³¹ wrote that the incorporation into operative gynecology of methods involving incision gained ground very slowly on account of the poor success with reference to the mothers. But there has been a change in this respect in the last few decades. Locating the cause of the high morbidity rate, successful removal of injurious factors, improvement of technic, which is continuously reducing the danger of this procedure, careful choice of cases and finally the placing of higher value upon the life of the child, which was often destroyed when other operative procedures were used, all of these factors have tended to greatly widen the indications for abdominal or vaginal cesarean section to great advantage for both mother and child.

But it is true, of course, that only those gynecologists can work successfully who are conscious of the limitations and know the dangers and are qualified to evaluate them correctly and at the same time are entirely familiar with the technic.

The operative method which entirely avoids the natural path of delivery is abdominal cesarean section. It was formerly performed by opening the body of the uterus. Now it is performed in the following manner: After pushing aside the bladder the incision is made in the lower cervical part of the uterus so that after closure, the wound will be outside the actual peritoneal cavity. Sometimes in unclean cases in order to prevent infection, opening of the peritoneal cavity is avoided by making the incision immediately above the symphysis and pushing the bladder, together with the peritoneum, away from the cervix. After opening the cervix, the extraction of the child proceeds entirely extraperitoneally—there is only a wound in the connective tissue.

The operation itself, especially in the transperitoneal procedure, is unusually simple. The fact that the area can be viewed with the eye is responsible for prevention of any great difficulties in operation. The amount of blood coming from the incision wound, even if one should chance to strike the region of the site of attachment of the placenta, is often very small, not even necessitating the use of clamps. Atony of the uterus might occasionally be a disturbing factor, but this can be avoided by the injection of secacornin immediately before making the first incision or later by intravenous injection of hypophysin.

Likewise, the suturing causes no particular difficulties except that it is somewhat more complicated if the original incision is too small and is enlarged by spontaneous rent in the tissue.

The extraction of the child is usually also very simple, especially if the head is so turned that the face will spontaneously enter the incision, thus making it relatively easy to apply the forceps.

The prognosis for the mother has also become much more favorable within the last few years. As late as 1882 the mortality was still equal to 50 per cent or more, while in our day it has been reduced to about 5 per cent of the former rate in various clinics: Bumm, 3.5 per cent; Döderlein, 3.5 per cent; Franz, 2.3 per cent. De Lee and E. L. Cornell even lost only one woman by peritonitis in a total of 150 cases. Benthin himself in a total of 62 cases operated since 1898 had a mortality of only 5 cases, *i.e.*, 8 per cent, which would be recorded as direct results of the operation (total mortality 16 per cent). In cases of contracted pelvis mortality was equal to 6 per cent.

In most cases the course of the puerperium is uneventful. In Benthin's cases the postoperative morbidity rate was equal to 14 per cent (among these 4 cases of parametritis). Richter reported morbidity figures of 27 per cent and Lonne of 17 per cent.

It may be said that since the position of the incision has been changed, so as to be located in the cervix, some of the possibilities, especially ruptured uterus, are becoming more and more rare. In fact, ruptures have rarely been observed in cases of reactionless recovery of the wound. Of course, they are not entirely avoidable. It is, however, noteworthy that King recently reported 2 ruptures among 23 of his own cases. Formation of adhesions is very slight as is observed in repeated cesarean section. Even very difficult and dangerous deliveries have been carried out without injury. Thus, a patient who in 1910 was delivered by cesarean section, in 1912 gave birth by version and extraction, in 1913 gave birth spontaneously, and in 1920 a perforation of the fetal head had to be performed. In 1921 Benthin performed a second cesarean section on this patient and found no peculiarities in the cesarean scar; the same is true of 3 other cases of repeated cesarean section. On the other hand, he recently observed 2 cases in which birth was awaited by the normal process, and he was able to find no peculiarities. The danger, therefore, in connection with later deliveries is very small. This proves, moreover, that the possibilities of success in abdominal cesarean section are remarkably great and that the dangers to the mother are being reduced more and more, and so it is to be expected that a change in the point of view concerning special indications must take place.

Labhardt¹⁸² stated that as a rule in his clinic cervical transperitoneal cesarean section was used, making the incision as near the lower end of the uterus as possible. All previous vaginal examinations should be carefully avoided. Between 1917 and 1925, 200 cesarean sections were performed, 9 died, constituting a mortality of 4.5 per cent. Of these 9 cases, 7 succumbed to complications (3 eclampsia, 1 tuberculous meningitis, etc.) The 2 who died as a result of operation were victims of peritonitis. Of the 104 infants, 38

died, 14 before cesarean section. For the sake of the children, operation is performed under local anesthesia until just before the extraction. Indications: Contracted pelvis, 87 cases (more of them on account of relative disproportion with reference to the head than on account of absolute contraction); placenta prævia, 60. Other indications: Toxic conditions, cardiac disorders, threatening asphyxia, transverse presentation, rupture of the uterus, tumors. Porro's operation is used chiefly in cases of infection and as the most rapid method of combating hemorrhage in cases of eclampsia and placenta prævia.

J. L. Lackie wrote that recent experience of the lower uterine segment incision makes one hopeful that it may be an improvement on the classical operation.

Hodgkins,¹³³ in his paper, gave the technic of the Hirst operation and gave its advantages as follows: (1) The peritoneal cavity is protected from the spill and there is no handling of bowel; therefore, shock and postoperative intestinal complications are minimized. (2) The layers are rapidly sealed and in the case of a puerperal septic uterus, drainage is extraperitoneal. (3) There can be but few intraperitoneal adhesions. (4) Transperitoneal cervical cesarean can be repeated. (5) The operation is applicable in both clean and infected cases.

Krönig¹³⁴ reported a cesarean section in a case of polyarthritis deformans and destruens with ankylosis. The cervical transperitoneal cesarean section was used. This was the only method possible on account of the rigid condition of the patient's arms which lay upon the upper abdomen and could not be removed even under anesthesia. The mother recovered; the child died within three days. Sterilization was not performed because extending the time of operation might have proved fatal in view of her very weak condition.

Quigley¹³⁵ reviewed four variations in technique: Krönig, Beck, De Lee, and Hirst. He concluded that the low cervical cesarean section had two fields of usefulness: (1) For the case where because of length of labor, frequent examinations, ruptured membranes or induction of labor, one would hesitate to do a classical section. (2) It permits of a test of labor in the border-line pelvis and because of this many cases can be safely delivered *per vaginam* which otherwise might be subjected to a classical cesarean section early in labor.

Essen-Möller,¹³⁶ in an extensive study entitled "Transperitoneal or Extraperitoneal Cesarean Section in Infected Cases," brought out a number of important points. He had already pointed out the classical cesarean section ought not to be performed in these cases. One of the chief reasons of the cervical section has, as we know, been to guard the mother also in infected cases. Has, then, the cervical section proved to answer the expectations in this respect, and how do the transperitoneal and extraperitoneal sections stand in relation to each other?

Out of 194 transperitoneal cesarean sections from Hofmeier, Franz and Baisch no less than 50 per cent were infected, and yet there was only 1.5 per cent of deaths. Out of 444 extraperitoneal cesarean sections half the number had in the same way to be regarded as infected and resulted in a death rate

of 5 per cent. Considering that many of the mothers had high fever prior to the operation, and, furthermore, that the fetus in these cases would have had to undergo embryotomy if one had not wanted to have recourse to Porro's operation, it is quite evident even by this that a new sphere opens to the cervical cesarean section, whither the classical section cannot attain. Our task will then be to investigate which of the two cervical sections can be regarded as superior to the other one.

This task will be rather awkward for Essen-Möller, for the reason that he has not as yet performed an extraperitoneal cesarean section. He is also conscious of the difficulty of appreciating an operation, of which one has no personal experience. In his capacity of clinical tutor it has, however, been his duty to examine the reasons for and against to the best of his ability, and then to take up an attitude toward the question. The following analysis is not meant to be anything but an explanation of his own personal opinion.

One ought then to take into consideration: (1) the technic; (2) the results; (3) subsequent deliveries.

1. As regards the technic of the extraperitoneal cesarean section, its advantage is to be found in the fact that the abdominal cavity is not opened and is thus guarded against becoming infected by the amniotic fluid. Unfortunately, however, the matter stands thus, that this object is not always successfully accomplished, the peritoneum being ever so often opened unintentionally. Küstner, who, as is well known, is the most ardent champion of the extraperitoneal cesarean section, admits this, but asserts as his opinion that the operation can then no longer be classed as extraperitoneal. He does not, therefore, take these cases into account, but refers them to the transperitoneal sections, which is quite justifiable. But, then he ought to state how often he has met with this calamity, which is of great consequence both to the result and to the estimation. Unfortunately, Küstner does not mention anything about that. Guided by the experience of others it is, however, not impossible to appreciate this difficulty. Bumm damaged the peritoneum unintentionally in 30 cases out of 116, thus in about 32 per cent; Wertheim in 38 per cent. As these two are men of great experience, one may quite well presume that others would not arrive at lower figures. Essen-Möller knows only one who has been more successful, namely, Döderlein, who has successfully performed the extraperitoneal operation in 137 out of 145 cases. From these figures it will be evident that not even the most experienced practitioners can always manage to avoid the misadventure in question which he estimates at about one-half of the cases. If, then, the operation is performed in an infected case, it is quite obvious that a lesion of the peritoneum exposes the abdominal cavity to the same risk as an originally transperitoneal operation, even if we consider that the lesion was discovered and immediately stitched. Thus, from this point of view, the extraperitoneal section has preference only in these cases where the peritoneum remains intact.

Concerning other technical difficulties, such as the access to the cervix, the pushing back of the bladder, the risk of bleeding or lesion of some other kind, the reports are contradictory, inasmuch as some consider the extraperitoneal

section to be more complicated, while others, *e.g.*, Lundblad, praise the ease with which it is performed. I think one may agree with Küstner, that technical difficulties must not be the only decisive factor, if outbalanced by advantages in some other respect.

2. The result obtained by the two methods of operation will of course be determinative of the question about their preference. Concerning the mothers first of all, Küstner is able to communicate a series of 183 extraperitoneal operations with 4 deaths, 2 of which were from infection. Considering that 50 per cent of these have had fever previous to the operation, and that Küstner does not allow himself to be deterred from the interference however high the fever may be, one must really admit that the results at which he has arrived are magnificent. The only regret, he has said before, is that they have not learned how many cases have been deducted owing to the peritoneum having been injured.

One will arrive at an equally favorable opinion of the value of the operation in infected or suspected cases, if one examines the results of others. Considering together the 444 cases of Bumm, Döderlein and Küstner, which undoubtedly one is justified in doing in view of the technical skill of these three men, one finds that these cases have resulted in 22 deaths, thus about 5 per cent. Should we deduct the 11 cases, which the parties concerned do not themselves regard as being chargeable against the operation, the death rate would only be half as large. But Essen-Möller is not inclined to such a reduction, at least not for all the cases. The efficacy of the extraperitoneal cesarean section is at all events clearly proved even without making that reduction. The following case, for which he is indebted to a personal communication from Lundblad, is a fine proof of what the operation can accomplish in an infected case: A 29-year-old primipara, in labor for three days, fits of shivering, temperature 39.2° C. Extraperitoneal cesarean section by Lundblad. Subsequent suppuration, which ceased, after Carrel treatment, for ten days. Mother and child were discharged in good health.

If we now contrast these 444 extraperitoneal cesarean sections and their 5 per cent mortality with the 194 transperitoneal cesarean sections of Hofmeier, Franz and Baisch, we find that these latter gave three deaths among the mothers. Equally favorable results are reported by Walthard of Zurich: 206 transperitoneal sections with 4 deaths, thus only 2 per cent. Before the operation 27 of these had a temperature of more than 38° C., 5 of which had post-operative complications, while only 4 of the remaining operated ones suffered from complications. Walthard also performed the operation in cases with permanent fever and is no believer in the extraperitoneal cesarean section. We may mention here that Baisch, too, who was a firm adherent of the extraperitoneal section, has now abandoned it for the transperitoneal.

From what has been said above, Essen-Möller can only draw the conclusion that the transperitoneal cesarean section has given just as good or perhaps somewhat better results to the mothers than the extraperitoneal section, even in positively infected cases. This is really rather surprising. One would expect the microorganisms to be more dangerous for the peritoneum than for the

connective tissue, and a phlegmon to be less dangerous than a peritonitis, even though the latter becomes localized to the lower region of the abdominal cavity. Moreover, it is this theoretical presumption that is always advanced as a support for the extraperitoneal cesarean section. The account given above shows, however, how little weight theoretical reasons carry as against practical results. The end of an infection is determined not only by the seat of the infection but also by many other factors. When Lundblad states that it is not only a question whether the connective tissue or the peritoneum has the greatest resisting power but also in which place we are best able to control an infection that has already begun, then one is inclined to agree with him from a theoretical standpoint. But when he, nevertheless, afterwards expresses the opinion that this is done most easily in the connective tissue, it does not seem as if the results, which I have just now mentioned, confirmed such an opinion.

We have further to examine the results as far as the fetuses are concerned. Two hundred and seventy-nine extraperitoneal cesarean sections by Döderlein and Küstner gave one fetal death, whereas 274 transperitoneal cesarean sections by Franz, Baisch and Hofmeier and Fehling gave 2 fetal deaths. As the number of cases is almost exactly the same in both methods, one may say that the former operation in the most experienced hands has given a fetal death rate that is about five times as large as the death rate of the latter operation. As it is here a question of an operation that is performed in the interest of the fetus, and as the results are not worse to the mother, I think it is hardly possible to come to any other conclusion but that the transperitoneal cesarean section has so far proved itself superior to the extraperitoneal one. For these reasons Essen-Möller has not performed the latter operation, nor is he disposed to do it until it has been proved by experience that it holds just as good prospects for the fetus as does the transperitoneal operation.

In conclusion Essen-Möller just mentioned another point of view for the sake of completeness. Bohrbach has stated that the extraperitoneal cesarean section in 8 per cent of the cases has been attended with abdominal hernia. It is hardly probable, however, that the account of the operation is too much overburdened by this experience, and if draining of infected cases gets more common also after transperitoneal sections, the results of both operations will very likely be about the same.

3. The extraperitoneal section may be performed on the other side at a subsequent delivery, but this seems to be attended with certain difficulties, for Döderlein has only succeeded in doing it in 7 cases out of 20, whereas in the remaining cases he had to have recourse to the transperitoneal operation. As a woman who has once undergone a cesarean section has been told, of course, to turn up at the clinic in good time at a future delivery, the operation can be performed under so favorable conditions that there can be no misgivings either about the transperitoneal or the classical cesarean section.

The opinion at which Essen-Möller has arrived, owing to the preceding investigation, may be expressed as follows: The classical cesarean section is contraindicated in infected cases, unless one intends following it up with Porro's

operation and has to yield to the cervical methods, by means of which it will no doubt be possible to avoid embryotomy of the living fetus even in infected cases. With regard to the two cervical cesarean sections the experience gained up till now seems to indicate that there is nothing much to choose between them as far as the result to the mothers is concerned, possibly with a slight preference to the transperitoneal section. In regard to the fetuses, the transperitoneal section is decidedly superior to the extraperitoneal and is therefore to be preferred, especially as it is undoubtedly more simple from a technical point of view.

Brindeau,¹³⁷ writing on the cervical cesarean section, stated that although this operation is performed rather extensively in foreign countries, it has not yet been adopted in France. Schickelé and Brindeau are the only ones who have published results with it.

Brindeau has the statistics of 59 cases, operated upon since May, 1924, and considers this sufficient material upon which to form an opinion of the operation.

We have very extensive statistics on the classic cesarean, comprising many thousands of cases. These statistics show, on the whole, about 8 to 10 per cent mortality, whatever might be the indication for it. Thus it is a serious operation; but as in every operation or every disease, it is necessary to take into consideration the different cases, to arrange them so as to judge of their respective severity. When one undertakes to do this, one perceives immediately that there are two very different varieties of operation:

The cesarean operations performed in clean cases, that is, on women not in labor or right at the beginning of labor with intact membranes, who have not been examined in any way. For these clean cases, the mortality oscillates around 2.9 per cent.

If, on the contrary, one examines the infected cases, that is, the cases of women in labor for several days, having ruptured membranes, the mortality immediately rises to 10.8 per cent. Finally, for the women who have been examined by several persons, and who have undergone at home one or two forceps applications without success, the mortality again takes a great jump to 34 per cent (Routh).

Brindeau refers to the mortality statistics published in 1922 by Kerr and Holland on 4000 cases. The consequence is that, in order to have the very best results in the classic cesarean operation, it is necessary to operate only the clean cases. The operation performed under these conditions becomes comparable to the uncomplicated removal of an ovarian cyst.

The extraperitoneal cesarean operation seeming unsatisfactory, the tendency was to return to the classic operation, but Krönig demonstrated that it is not necessary to fear the peritoneum, and that if the woman died after a corporeal cesarean operation, it was not because the peritoneum had become infected at the moment of operation, but because the serosa had become secondarily infected during the puerperium.

Summarizing, it is Krönig who demonstrated that in simply incising along the lower segment, in passing across the peritoneal cavity (suprapubic trans-

peritoneal cesarean operation) instead of incising along the body, one obtains very much better results.

Again, the only thing which one could truly hold against this operation is that it is longer and more difficult.

What are the results of the low cesarean operation?

It has not been practiced long enough for one to be able to form a very sound opinion; however, we already have numerous statistics. Brindeau mentions a few names: Krönig, Krause, Van Rooy, Aubert, Hirst, De Lee, Beuttner, Gaifami, Phaneuf, Walthar, P. Gall and finally in France, Schickelé and Brindeau himself.

Marassy, one of Brindeau's pupils, wrote his thesis on this subject a few months previously, and gathered 1200 cases operated upon by different authors. Of these 1200 cases, the inclusive mortality is about 3 per cent, which is satisfactory.

Moreover, one encounters uterine rupture from time to time in women who become pregnant again; of 100 cesareanized women, there were 4 ruptures of the uterus on the occasion of another pregnancy; while, in the low cesarean, it appears that this inconvenience would not exist or would be exceedingly rare.

It is in the infected cases that the low cesarean can render the greatest service. Let us compare the mortality in the two varieties of operations:

The high cesarean gives about 10 per cent mortality when one does not consider the infected cases. The low cesarean gives from 2 to 3 per cent mortality for the same group of cases. There is thus a great difference in favor of the low cesarean. Moreover, the opinions of foreign authors are extremely clear: those of Hirst, Krönig, Phaneuf; Schickelé in France is of the same opinion.

Summarizing, in the clean cases, there is not a very great difference between the two operations. Brindeau believes, however, that the low cesarean is preferable. In infected cases, the low cesarean is certainly better. It has the advantage, moreover, of preventing the performance of a certain number of cesareans which are otherwise uselessly performed when one operates at the end of pregnancy.

It also avoids a certain number of pelviotomies—operations of relatively dangerous consequences. It avoids some hysterectomies, since, a short time ago, when one performed the cesarean on a woman, possibly infected, one removed the uterus.

Finally it permits avoiding certain mixed operations (such as that of Portes) which can render service in very rare cases, but which remain, in spite of all, operations that do not come up to the standard of good surgery.

Ballantyne¹³⁸ was impressed with the fact that the cervical cesarean section has considerable vogue in Germany, and Lichtenstein has recorded 143 such operations. In 106 of these cases he performed the intraperitoneal operation, and in the others a form of the extraperitoneal or of the transperitoneal method was employed (in 3 cases it was Frank's, in 11 Sellheim's, in 11 Latzko's, and in 12 Latzko-Zweifel's). The true extraperitoneal plan is much less heard of now than formerly, the difficulty of reflecting the peritoneum

from the bladder without buttonholing, and the fact that in many cases prevention of peritoneal infection is only achieved at the expense of infection of the cellular tissue, have mitigated against its general adoption. McGlinn carefully weighs the advantages and disadvantages, and he finds much that is satisfactory in the ordinary conservative cesarean section as done by Säger. It ought to be remembered that many operations described as extraperitoneal (*e.g.*, Brodhead's 11 and Langrock's 59) are little removed in reality from transperitoneal, and that not a few of the transperitoneal are truly intraperitoneal. While the genuine extraperitoneal plan has probably ceased to be of practical importance, many obstetricians (*e.g.*, Gaifami) will not agree with McGlinn that the transperitoneal methods do not warrant further investigation and trial; indeed, McGlinn himself finds good points in Beck's operation (a modification of Krönig's). Beck described his procedure in 1919, and he amplified the description in 1921. T. S. Welton has also used the method in 11 instances and thinks it is the operation of choice in all potentially infected cases. It has been termed, "the two-flap low incision cesarean section."

Brandt,¹³⁹ in a twenty-four-page article, discussed his ten years' experience with suprapubic section, giving some statistics, likewise details of technic, discussion of indications and time of operation, as well as contra-indications, study of infected cases, course of recovery of mothers and children delivered by section. He concluded with the following summary:

A. With reference to extraperitoneal section:

1. In comparison to intraperitoneal section the extraperitoneal procedure shows certain technical difficulties. The alleged shortening of the time is not so great. In the intraperitoneal procedure the blocking-off process, however, consumes time. In Brandt's clinic, according to the history of the cases, the child is extracted after from five to ten minutes and the operation is completed usually in less than half an hour.

2. The transperitoneal procedure cannot stand as an independent method on the same level as the extraperitoneal and intraperitoneal methods but must be subordinated to these in connection with closing the peritoneum before opening the cervix in the extraperitoneal and in connection with walling off the abdominal cavity in the intraperitoneal procedure.

3. Extraperitoneal section must be divided into two subdivisions, *vis.*, pure extraperitoneal or unlimited extraperitoneal and limited extraperitoneal section. To the latter belong the cases in which injuries to the peritoneum before opening the uterus have been made, so that the extraperitoneal idea is preserved.

4. Extraperitoneal section is accompanied by adhesions which may cause difficulties when the operation is repeated.

5. The extraperitoneal method carries the disadvantage of rents of the peritoneum in connection with extraction of the head, if the cervical incision is too small and the spectrum is grasped too firmly. Because of this there is danger that infectious matter may enter the abdominal cavity.

6. In extraperitoneal section infection does not constitute a contra-indication.

7. In extraperitoneal section the pushing aside of the peritoneum is rendered much easier if the woman has been in labor for some time and the cervix has developed at least to a certain extent.

B. Concerning delivery by section in the cervical canal in general:

1. Suprapubic is to be recommended as a collective term for all abdominal cervical deliveries by section.

2. Trendelenburg's position is not necessary.

3. Longitudinal incision makes possible a good view of the field of operation and is, on account of its simplicity, to be preferred to others.

4. The indication for delivery by section in the cervical canal may be extended to include more cases on account of greater safety to life. Even when the child is dead, section is necessary occasionally in order to save the mother.

5. Complicated measurement of the pelvis is not necessary. Palpation of the pelvis and determination of the diagonal conjugate in cases of contracted pelvis are sufficient. If this does not constitute an absolute indication, observation of the delivery process should be used as a further method in preference to complicated measurements of the pelvis.

6. Drainage is necessary only in cases of infection or when it is not possible to achieve a bloodless wound in the connective tissue. Otherwise, in general there should be primary closure of the abdominal walls.

7. The placenta should be removed through the incision.

8. The cervical scar is very durable. Two layers of sutures are sufficient; the mucous membrane should not be pierced by the major suture.

9. Lumbar anesthesia is considered preferable; Brandt has never observed dangerous effects upon the child.

10. Care should be taken in determining the indication for section in cases of previous operation in contracted pelvis on account of high infant mortality.

11. Artificial abortion is advised only in multiparæ who already have living children.

Holland,¹⁴⁰ in a paper entitled, "The Lower Segment or Cervical Operation," was of the opinion that in spite of the great merits of the classical operation, many surgeons are not entirely satisfied with it, and have devised other methods of abdominal delivery which will avoid the defects mentioned as inherent to the classical. These new operations can all be grouped together under the designation of "cervical" or "lower segment" cesarean sections. As long ago as the beginning of the last century an operation was devised for opening the lower uterine segment extraperitoneally through an incision above Poupert's ligament; it was revived by the American surgeon, T. Gaillard Thomas, in 1870, under the name of gastro-elytrotomy, as an alternative to the ordinary route, in order to avoid the dangers of septic peritonitis. But the operative

mortality was as high or higher, and it quickly dropped out when antiseptics and Sanger's method of suture came in and brought such good results.

The lower segment operation with a greatly improved technic has lately been revived, and its chief exponent in the British Empire is Munro Kerr. The many methods of performing the operation can be divided into extra-peritoneal and transperitoneal. These Holland does not discuss, but confines himself to the description of the simple transperitoneal operation, the technic of which has already been mentioned.

Holland has employed this operation so far only 9 times, and has been extremely pleased with it. Its advantages over the classical are, he considers, the following:

1. The wound lies in a quiet part of the uterus, and is at rest during healing. There is no tendency for the edges of the wound to be drawn apart, or for gaps to be formed between the sutures. For these reasons healing occurs under more favorable circumstances than in the classical operation.

2. The uterine incision is made through a less vascular area, and bleeding from the edges is extremely slight.

3. The edges of the wound are thin; suture is therefore easier and quicker.

4. The position of the wound is such that adhesions to the intestines, omentum, or abdominal wall cannot occur; there is only a short line of peritoneal sutures at the bottom of the uterovesical pouch.

5. The uterine wound is covered with a thick layer of fascia and by the bladder, and perfect closure of the peritoneum can be made. For these reasons there is less likelihood of infection of the peritoneal cavity; for it is generally conceded that the source of peritoneal infection is not so much due to contamination by liquor amnii or other uterine contents during the operation as to the subsequent passage of infection from the uterine cavity between the edges of the incision. Should peritoneal infection occur, the lower abdomen is more resistant than the upper.

6. The operation causes less disturbance of the abdominal contents; the intestines are never seen.

7. The scar is in a safer area for subsequent pregnancy and labor, for the lower uterine segment stretches late in labor. The stretching to which the scar is subjected is purely passive, for there is no powerful active drag upon each side of the scar, as there is in the scar of the classical operation.

8. As regards the performance of the operation, it is just as easy to a practiced surgeon as the classical; true, there is more "operating" in it, it is not done, as it were, by two strokes of the knife, as is the classical. The more advanced the patient is in labor, the easier will the operation be and the lower will the incision lie in the lower segment and cervix; in fact, in cases of excessive retraction of the uterus, the incision will lie partly in the upper end of the vagina.

9. So far only one case of ruptured scar has been reported, and this is not a fair case, as the upper end of the incision had to be extended upwards on to the body of the uterus. At the same time it must be remembered that

very few lower segment operations have been done compared to the many thousand by the classical method.

O. Küstner,¹⁴¹ stated that in his clinic the extraperitoneal cesarean section has been used for a number of years, the total of these operations amounting to 200 at the time of writing. He says that he introduced the method hoping to avoid the perforation of living children, and met with such decided success that he now feels that this ghastly operation is no longer necessary, the maternal mortality in his cases being less than 1 per cent.

With reference to the fever, Küstner states that his cases prove that fever in itself does not contra-indicate extraperitoneal cesarean section. Fever does not necessarily indicate grave infection. If the temperature drops to normal immediately after delivery it is assumed that there was probably only action of toxin due to germs in the liquor amnii and that after this flows out and the child is eliminated the cause of the fever disappears. In other cases there was infection of the tissues, which however was capable of recovery, and it was assumed for these cases that recovery would follow more easily upon an operation which inflicted no wound upon the mother, *vis.*, perforation, than upon a major wound such as the extraperitoneal incision. That, of course seems reasonable. He willingly admits that in the first instance the infection remains localized in the uterus while in the second it is extended to the extraperitoneal incision, so that a longer time would probably be required for recovery, but there is nothing to prevent one from assuming that the germs which do not act fatally within the uterus (whose inner surface, both anatomically and as a fertile field for bacterial infection, has all the significance of a wound) could also be borne without danger in the extraperitoneal incision, especially since this wound is particularly protected against bacterial infection by open surgical treatment. If this were not true his clinic would have had more than 2 deaths from sepsis among their 200 cases, since practically one-half of them ran temperature during delivery.

If, on the other hand, the organisms have a high degree of virulence, the infection attacks the inner surface of the uterus and its substance; whether recovery would occur without incision in cases in which incision would be fatal is the crux of the whole matter, and this is a question which can never be definitely answered. This much is certain, however: In both of Küstner's fatal cases, autopsy showed the endometrium to be seriously infected; from this the incision wound and finally the peritoneum became infected. In both cases there would have been genital infection as grave as that observed in death from puerperal sepsis even if no operation had been performed. Now it is probably logical to assume that after the extraperitoneal incision is infected, peritonitis may more easily occur than from the direction of the inner surface of the uterus. One might suppose that the peritoneal plica, which has been pushed aside, has more permeability for bacteria than the thick wall of the uterus, stretched beyond its limit by days of labor in the presence of a contracted pelvis, and reaching almost the thinness of an intestine. Is it not true that often the entire muscular layer is stretched to such an extent

that only mucous membrane and peritoneal covering remain, a layer no thicker than the peritoneal plica mentioned above? Likewise the autopsies of the 2 cases of sepsis showed nothing to indicate that the peritonitis originated only from the cesarean wound and not at all from the infected uterus.

One is always driven back to the fatalistic résumé: If the gravida is already seriously infected, immediate delivery will in no wise save her, nor will extraperitoneal cesarean section, and the same can be said of perforation; von Redwitz, himself, admits that among his 74 cases of perforated living children there was one case of maternal death.

The view that tympanites of the uterus constitutes an especially unfavorable form of infection cannot be defended in every instance. It cannot be denied that among the gas-forming agents there are often very dangerous forms of bacteria, but in spite of this fact Küstner says that in a number of his cases of extraperitoneal cesarean section he observed escape of gas without grave disturbance to the postoperative course. It is simply impossible during delivery to distinguish fatal infection from the harmless forms. Bacteriological findings leave us entirely in the lurch. Neither the presence of streptococci nor that of other bacteria in the liquor amnii furnish a criterion. Likewise clinical symptoms such as poor general condition, etc., could certainly not be used as a test in a patient who has been under labor for days and nights in the most intense pain and without sleep.

Baumm¹⁴² stated that since October 31, 1922, 133 cases of suprasymphys-eal delivery occurred in his clinic in a total of 7018 deliveries. This showed a frequency of operation of 1.9 per cent. Of the 133 mothers, 2 died, showing a mortality of 1.5 per cent. But one of the mothers died of embolism caused by the entrance of air while on the operating table, an accident which has no connection with the operation. Only one woman died of the effect of operation (infection), *i.e.*, these 133 cases show a maternal mortality of 0.75 per cent. This is a decided improvement upon a previous series which showed a mortality of between 2 and 4 per cent.

The results were good in spite of the fact that 52 were not clean cases, *i.e.*, the amniotic sac had been ruptured many hours, the patients were running a temperature and the liquor amnii was malodorous. The 2 cases of death were from this group. The woman who died from embolism was operated upon thirty-seven hours after the rupture of the amniotic sac and showed an os uteri the size of the palm of the hand; the other fatal case was operated ten hours after the passage of liquor amnii and showed an os uteri completely open. The urinary bladder was injured at the time of operation, and the wound suppurated; the patient died forty-seven days later from infection.

From the 133 mothers, 135 children (2 cases of twins) were delivered. Of these, 3 (2.2 per cent) were stillborn or could not be resuscitated. One of them succumbed with distinct signs of intracranial pressure. This infant was extracted forty-one hours after rupture of the amniotic sac, evidently too late even though the heartbeats were still quite good at the beginning of the operation. This corroborates Baumm's view concerning the evaluation of the fetal heartbeat (see *Arch. f. Gynæk.*, 107). The cause of death of the

other two children could not be determined. The one was extracted before rupture of the amniotic sac and in the case of the other one the sac had been ruptured for only one and one-half hours. Autopsy remained negative, likewise Wassermann of the blood from the umbilical cord and retroplacenta. Nor could lumbar anesthesia be looked upon as the cause, because the heart-beats did not decrease materially thereafter, as is so often the case.

Now Baumm adds what he considers a very important fact, *viz.*: that 8 other children died before the mothers were dismissed: 1 from pemphigus, 1 from furunculosis and 6 from the effects of delivery, *viz.*, 1 from erysipelas, beginning at the points of pressure on the skull, and 5 from symptoms of intracranial pressure. From a total of 135 children, 11 were lost, 7 of them without doubt because the operation was performed too late. Therefore, operation should be performed earlier for the sake of the infants. The same conclusion is reached if the course of recovery in the mothers is observed.

Eight mothers enjoyed smooth recovery so that they could be dismissed in good condition between the tenth and twentieth day. On the other hand, recovery was interrupted and delayed in 43 cases, stretching out over a period of three weeks. In the majority of cases delayed recovery was caused by fever with or without suppuration. In 2 cases exudate from the pelvis is recorded, in 2 cases thrombosis of the femoral vein, in 2 cases pneumonia and in one case each fistula of the bladder and abdominal wall, and neck of the bladder. Both fistulae originated spontaneously, there having been no injury to the bladder during operation. The operation was performed respectively thirty-six and fifty-four hours after rupture of the sac. Late enough to make it clear that from the long-drawn-out pressure, the bladder had become damaged. Besides this, the urinary bladder was injured during operation in 5 cases. This is entirely too often. The cause can be ascribed only in slight degree to defective technic, since the operation has been performed more than 300 times. Baumm suspects that the chief reason lies in the fact that operation was deferred too long, a period of ten to twenty-four hours. Injuries to the bladder were of course sutured; 4 healed smoothly, while the fifth was one of the fatal cases.

It is noteworthy that the 43 cases of disturbed recovery included 34 septic cases and only 9 aseptic. Even if the 43 cases were capable of recovery, it still must be borne in mind that a reduction in morbidity is a prime need and this goal can and must be achieved if the septic cases are eliminated as much as possible, *i.e.*, if operation is performed earlier; it should not be difficult to decide on early operation if the surgeon bears in mind that the operation, if performed in appropriate cases, may be looked upon as involving practically no risk to life. He admits that he is in the face of one of the old established principles of obstetrics and that, in some cases, were operation deferred long enough, delivery might take place spontaneously, but he reminds us that such a procedure would be hazardous to both mother and child. These dangers, he says, are much greater than those of suprapubic section performed at the proper time which shows a mortality of 0 for the child and of 0.75 per cent for the mother. The old conservative therapy in cases of contracted

pelvis shows a much higher mortality for the mother, to say nothing of the child.

For eventual later deliveries the suprapubic does not represent any particular danger. Of the 133 women 30 were delivered by section a second time, 5 a third time, and one a fourth time. In general the operation was not more difficult than it was the first time. At the same time it is noteworthy that in the extraperitoneal procedure, the peritoneum tears more easily each time the operation is performed. That, of course, is easy to explain because there are always more and more scars to loosen, but this seldom interferes with success. He states that in his material he did not find that the scar in the uterus constituted an area of lessened resistance. In the 30 cases of repeated operation all incisions healed very readily, therefore it seems that the operation may be repeated as often as desired in the same woman.

Baumm states that he cannot draw any comparison from his own experience between the extra- and the transperitoneal procedure, since he uses the extraperitoneal operation entirely but he does say that since accidental rents in the peritoneum often occur without serious results, he does not feel that the transperitoneal method should involve much greater risk than the procedure which he uses. His chief reason for choosing extraperitoneal is the fact that it is a decidedly smaller operation and does not open the abdominal cavity.

Klumper¹⁴³ thinks that he can draw the conclusion that the method of removing the placenta is a very important factor in connection with secondary hemorrhage in cervical cesarean section. Manual removal of the placenta is not to be recommended; Credé's method is better, and the normal process is best wherever it can possibly be used. There are, however, some conditions in which it seems desirable not to allow the placenta to remain for any length of time after the extraction of the child. In the first place the size of the opening of the cervix must be sufficient, preferably complete dilatation. If there is a possibility that the placenta may not loosen itself readily or if it becomes loosened during operation, it is removed through the incision.

There is a difference of opinion as to whether cesarean section could be deferred until the dilatation is large enough to permit the passage of the placenta. If the amniotic membranes are ruptured, it is not safe to defer operation for so long a time because of the danger of infection. At the same time he believes that in cases in which it is possible to await normal development of the third stage, it is to be recommended. The slight loss of blood is a decided advantage as a result of which the woman can not only resume her daily tasks within a short time but is also able to better overcome an eventual infection (should such occur) after a slight loss of blood than after an excessive loss.

Küstner,¹⁴⁴ in the first part of his article, reported experiments made on rabbits for the purpose of determining whether in cesarean section infants the condition in which they are born is due to asphyxia, action of narcotics, or apnea. He thinks that these experiments showed that the condition in which the cesarean section children are born can probably be explained exclusively by

the action of narcosis and the entrance of ether into the child's circulation. He terms this condition "asphyxia caused by narcosis condition." The respiration is shallow and infrequent and the heart action may be modified—all resembling the condition in adults given too much anesthetic. The anesthetic reduces the sensitiveness of the nerve-centers to carbon dioxid, so that when the child is extracted, the physiological process of respiration does not come properly into play. This occurs in an even more pronounced form when the mother has been given morphin (twilight sleep), as the newborn are more susceptible to morphin than to ether and chloroform. A third factor also coöperates to induce asphyxia in the cesarean section infants: In normal deliveries, the circulation in the uterus, and hence the supply of oxygen to the fetus, is shut off more or less during the labor pains. The blood is overloaded with carbon dioxid, and this would stimulate the respiration center to initiate respiratory movements if it were not that, as the labor contraction subsides, the blood and oxygen reach the fetus. There is thus an intermittent stimulation of the respiration center which, he argues, acts as a kind of preliminary training of the respiratory apparatus, which facilitates the child's breathing when it finally emerges into the atmosphere. Children delivered by cesarean section lack all of this preliminary training. They are born unprepared, and have not learned how to breathe.

In summary Küstner said:

1. The cesarean section infants are in an apneic condition during only a few seconds after delivery.
2. Apnea immediately makes the transition either to normal regular breathing or to asphyxia.
3. Asphyxia is caused either by narcosis of the mother or by absence of the physiological pressure upon the brain during the period of expulsion.
4. Successful combating of asphyxia can be accomplished only by free use of artificial respiration (Schultze's method).

Dujol¹⁴⁵ wrote that the low cesarean operation is still little used in France, but several foreign schools use it right along and almost substitute it for the classic hysterotomy. The principal advantage of this operation would be its innocuity in suspected or infected cases, those where labor has already commenced sometime before, where the membranes are ruptured, where there have been questionable manipulations, where there is a rise in temperature. This operation would then permit of rescuing the child without injuring the mother, in cases where, with the classic technic, one must choose between embryotomy and the sacrifice of the uterus. Thus the limit allowed for natural delivery before practicing intervention in the course of labor would be extended.

Without going so far as Wagner (of Prague) who regards fever as an indication for cesarean, Beuttner, Hauch, and Gaifami, insist that bacterial infection of the uterus is not a contra-indication.

Dujol would like to call attention, however, to the fact that of the 2 cases

reported, it is obviously the second which would appear theoretically to have had the best chance for success; because the patient had only had two questionable manipulations and these practiced under conditions of the greatest asepsis, intact membranes at the time of operation, and a temperature only slightly raised. The other patient, on the contrary, reached the operating table under conditions very much less favorable. It was she, however, who recovered.

This tends to prove that which is otherwise well shown by the experience of others, that the temperature and the number of examinations of doubtful asepsis are not sufficient to prognosticate an infection of the uterine cavity. It is necessary to take into account not only the quantity of the organisms, but their nature and their virulence. Unfortunately, this is a point on which there is nothing to guide one, when one must make a rapid decision in the course of labor, upon which depends both the life of the child and that of the mother.

Yet one word regarding the technic of cesarean of the segment; it is slightly more delicate than that of the high classical. In the 4 cases where Dujol has performed it, he has always had to have recourse to forceps, but the babies did not suffer from this more prolonged extraction. The extraction of the placenta and membranes is also less easy, because it cannot be accomplished in full view, as in the high cesarean, and finally hemorrhage seems more frequent. It is true that one can apparently master this quite easily by irrigation or by applying a compact uterovaginal drain.

Max Wetterwald¹⁴⁶ concluded his article as follows:

On the basis of his study it is evident that the danger of rupture of the uterus is very slight after cervical section. As factors leading to rupture, the following may be considered: Faulty technic of suture, infection of the wound during confinement, lengthening of incision, use of intra-uterine interventions for the purpose of hastening delivery (*i.e.*, version) and especially the occurrence of placenta prævia in the next pregnancy. Surgeons should be very careful in their use of hypophysis extracts. Rapid succession of pregnancies is hardly to be looked upon as a cause of rupture.

In all cases of cervical cesarean section it is imperative that women who have once been delivered by this method should place themselves under the regular care of a physician during the next pregnancy and at the time of delivery be cared for in a clinic.

Couvelaire and Portes¹⁴⁷ recently wrote that since 1906, the date when Frank of Cologne proposed the new technic of abdominal hysterotomy to which he gave the name of suprasymphysic cesarean, the idea of "cesareans" has developed.

The first attempts of Brindeau, of Jeannin, and of Doleris aroused only very moderate enthusiasm in Paris.

In 1922, Brindeau, after a fortunate series of 14 cases, concluded that in the clean cases the classical cesarean is "superior to the low cesarean," whereas in the infected cases he is of the impression that the latter is "less serious than the classical." Since this period, he has continued to study "subpubic cesarean."

Couvellaire and Portes, at the beginning of 1925, commenced to practice low cesarean section extensively by the transperitoneal method. They have practiced it, not only in the cases where the classical cesarean had been used previously, but also in some conditions where they hesitated to practice the latter because of infection established or probable.

They give their impressions gained from their first 30 observations. All their observations refer to the cases of pelvic contraction, in which there is a more or less marked disproportion between the size of the head and capacity of the pelvis. All these operations have been made in the course of labor.

1. In 15 cases, starting from the first pains, without which one deems it useless to attempt the test of labor. In 6 of these cases there was premature rupture of the membranes for a period ranging from two to twenty-one hours.

2. In 14 cases, the disproportion between the head and the pelvis being slight, the test of labor was attempted, but it proved ineffective. It was only tardily that the authors practiced low cesarean section: Seven times because after many hours of good uterine contractions, there was no progress in the adaptation of the presentation to the upper passage of the pelvis; six times because the dilatation being complete, and the membranes having been ruptured artificially, the outlook was not encouraging; once where the course of the test of labor had been assisted by a complete deflection of the head.

In 13 of these cases the temperature was normal at the time of intervention. In only one was there an elevation of temperature, 38.5° C.

3. In one case finally low cesarean was practiced as an emergency measure in a woman brought in with complete dilatation, having already undergone many applications of the forceps.

The following conclusions were reached from this study:

1. From the technical point of view, the low transperitoneal cesarean is less easy, but more satisfactory than the high classical cesarean, because one is under the impression that the suture made upon a portion of the uterus undergoing slight contraction is more perfect and will not subject the cicatrization to the strong contraction during labor which the entire suture of the muscular wall of the body of the uterus undergoes.

2. The immediate results of this operation appear more satisfactory than those of the classical cesarean from the point of view of peritoneal reaction. It is probable that it, better than high cesarean, guards against uteroparietal fistulæ or postoperative ileus from adhesions.

3. It is perhaps less dangerous than high cesarean in cases where the contents of the uterus are not absolutely sterile, but it is probable that in the cases where the contents are infected, the development of operative results will always be in relation to the kind and the virulence of the organisms.

P. Gaifami¹⁴⁸ has made an earlier report in favor of the transperitoneal cesarean incision on the lower segment. He now adds cases and follow up data and says, "The cases reported to the present and the reviews made permit

one to reach a favorable opinion regarding the resistance of the cesarean cicatrix on the lower segment and on the efficiency of the transperitoneal technic not only in doubtful cases, but also in those with undoubted bacterial contamination from the uterine cavity."

Wetterwald,¹⁴⁹ since 1916, found that there have been more than 200 low transperitoneal cesarean sections performed at the Maternité de Saint-Gall. In about half of the cases there was sterilization. As for the others, namely, 101 women in whom there remained the possibility of future conception, the subsequent history of all of them is known. About 45 per cent have had one or more subsequent pregnancies. In 13 cases the low cesarean had to be repeated either at his hospital or in another hospital. Thus, there was opportunity to examine the state of the old cervical cicatrix; in the majority of cases, it was no longer visible or appeared as a thin, white line. With the consent of the parturient it is at the time of this second intervention that Wetterwald, as a general rule, performs sterilization by removal of the tubes.

Franz speaks of 16 cases, in which he performed the low section three times on the same person, Grabich reported 18 cases of repeated operation; dePorenta mentions 3 such, and Gettiker one. Moreover, Franz performed this operation with success 4 times on the same woman.

Besides these 13 women, in whom the cesarean was repeated, 26 had 40 deliveries by the natural passage, without trouble. Of the 26, one was delivered 6 times spontaneously, another 4 times, a third 3 times, a fourth likewise 3 times; in the last, the first and third deliveries were terminated by forceps. Two other women were delivered twice, one of whom also had the aid of forceps. The other 20 women each had one delivery by the natural passage. Of this number, there was one application of forceps; another time, in breech presentation, extraction was performed; and finally, a case of transverse presentation with prolapse of the cord required version followed by extraction. In the case of one of the 20 women, an extra-uterine pregnancy occurred later, and she was operated upon at another hospital. Thus, all these 40 deliveries were produced at term.

Baumm¹⁵⁰ reported an extraperitoneal cesarean section in a dwarf, 112 cm. tall. Conditions were far from normal. A case of *chondrodystrophia fatalis*. The suprapubic extraperitoneal method under lumbar anesthesia was used. He always uses the extraperitoneal procedure in spite of the growing number of adherents of the intraperitoneal method.

Snoeck,¹⁵¹ in a paper entitled "The Test of Labor and the Low Cesarean Section," expressed the views of G. Shickelé, in whose clinic he had spent considerable time. The indications of the low cesarean are being enlarged even to the point of using it in infected cases. Experience has resulted in the fact that a number of clinicians wait to see the result of labor in border-line cases of pelvic contraction. Brindeau advocates this method and Shickelé has only had 2 per cent mortality after the test of labor. This method should only be used in a properly equipped surgical center. The accoucheur must stay near the parturient, and must follow the pulse, the temperature, the blood-

pressure and the fetal heart. The two sources of danger in this temporization are infection and tonic contraction of the uterus. Any negative test of labor must be followed by the low cesarean section. Sngcock further stated that infection is rarely severe after the cervical cesarean operation. The test of labor is ended when the head becomes fixed. According to him this test of labor is applicable even in contracted pelves, as it favors the formation of the lower uterine segment.

Up to the time of writing, Phaneuf has performed 246 cervical cesarean sections; in 214 of these a longitudinal incision was used in the lower uterine segment, while in the last 32, a low transverse incision was made in the cervix. In 56 of these operations the parietal and visceral layers of peritoneum were united by sutures before opening the uterus and in 190 the peritoneal cavity was protected by thorough walling off with gauze.

There were 15 maternal deaths in this series, a gross maternal mortality of 6 per cent. There were no deaths from peritonitis. The causes of death were as follows: Valvular heart disease and myocarditis, 3; acute dilatation of the stomach, 2; uterine apoplexy, 2; pulmonary embolism, 3; eclampsia, moribund on admission, operation in the interest of the child, 3; and pneumonia, 2.

A high percentage of the mothers had had long labor, rupture of the membranes, vaginal examinations and attempts at delivery through the pelvis before being subjected to operation. The fact that there were no deaths from peritonitis in this group shows that a definite protection is offered against spreading infection by this method of performing cesarean section.

There were three sets of twins in the series, 249 infants, therefore, were delivered; of these 15 did not survive or a gross fetal mortality of 6 per cent. The fetal deaths were ascribed to the following causes: Stillborn, 6; macerated fetus, 3; prematurity, 2; atelectasis pulmonum, 3; and congenital heart disease, 1.

In most of the cases where a macerated or a stillborn child was delivered, the indication for operating was a previous cesarean section of the classical or cervical type.

Scar of Cervical Cesarean Section.—Ninety-two cervical operations were performed by Phaneuf, on 39 mothers. There were, therefore, 53 repeated cervical sections. *Four gravidæ had 4 operations, 6 gravidæ had 3 operations and 29 gravidæ had 2 operations.* In 52 out of the 53 repeated sections, the lower uterine segment was found intact, the healing was perfect and it was impossible to distinguish the cervical scar as such. In one case, the forty-fifth in the series, a weak spot was found in the previous scar; this occurred at the second operation in a woman in labor eleven hours. The weak area, which was about an inch in diameter, was found at the upper aspect of the scar and was due to the fact that the previous incision had been extended into the body of the uterus; that part of the scar which had been placed in the lower uterine segment was found to be perfectly healed. It would seem that a transverse cervical incision being wholly placed in the non-contractile tissue might prevent this accident. For this reason Phaneuf has used such an incision in his

last 32 cases. His present impression is favorable. However, only the future and a larger series of cases will prove or disprove this point. There was no difficulty in separating the bladder when performing the repeated operations.

Four gravidæ were delivered through the pelvis subsequent to a cervical cesarean section. One had 3 normal deliveries, another 2 normal deliveries, while the last 2 each had 1 forceps delivery.

Technic of Low Cesarean Section with Longitudinal Cervical Incision.

—*First Step.*—ABDOMINAL INCISION.—The patient is catheterized, anesthetized and placed in the Trendelenburg position. The abdomen is opened by a median incision about 6 inches long, starting at the symphysis and ending near the umbilicus. A Doyen retractor is introduced at the lower angle of the incision and the lower uterine segment is well walled off with a long strip of gauze. One cubic centimeter of an aseptic preparation of ergot is injected in the thigh muscles.

Second Step.—LONGITUDINAL CERVICAL INCISION; DELIVERY.—The uterine peritoneum, where it is loosely attached above the bladder reflection, is incised transversely. An upper flap of peritoneum is separated and a low flap of peritoneum, together with the bladder, are pushed downwards. The Doyen retractor is now placed over the bladder to protect it. The assistant makes traction upwards on the uterus to bring the lower segment near the surface. A small longitudinal incision is made, with a knife, at the upper end of the denuded area, in the median line; this is extended downwards with bandage scissors until the incision is sufficiently long to permit the delivery of the child. The child is delivered by raising the head with the hand and making pressure on the fundus. Forceps are rarely necessary. If the breech presents, the infant is naturally extracted by the feet. One cubic centimeter of pituitary extract is injected in the thigh muscles at this time. If the parturient has not had labor, or if the cervix is but slightly dilated at the time of delivery, the placenta and membranes are expressed through the incision. If, on the other hand, the cervix was fully dilated, the cord is tied, dropped in the uterus, and the placenta and membranes are expressed through the vagina after the closure of the cervical incision and the union of the peritoneal flaps.

Third Step.—CLOSURE OF THE LONGITUDINAL CERVICAL INCISION AND SUTURE OF THE PERITONEAL FLAPS.—The cervical incision is closed in one layer with interrupted sutures of No. 2 chromic catgut. These sutures take in the mucosa as well as the muscularis and are placed about half an inch apart. The peritoneal flaps are now united with a continuous suture of No. 0 chromic catgut, thus making the cervical incision entirely retrovesical.

Fourth Step.—CLOSURE OF THE ABDOMINAL WALL.—The gauze strip is now removed, the omentum is brought down, intestines are practically never seen during this operation, and the abdominal wall is closed in layers in the usual manner.

Technic of Low Cesarean Section with Transverse Cervical Incision.

—*First Step.*—ABDOMINAL INCISION.—This is the same as in the procedure above described.

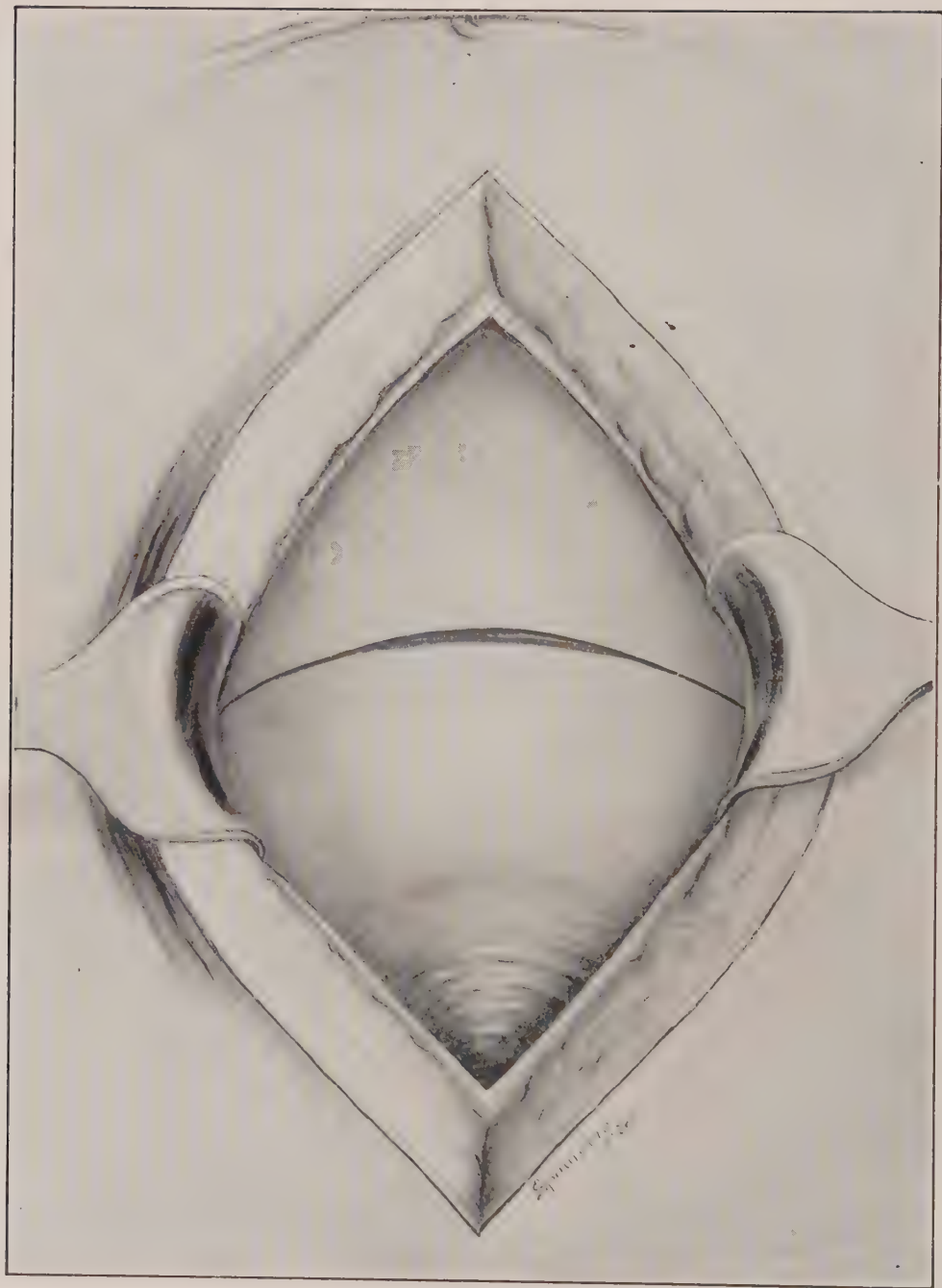


FIG. 59.—LOW OR CERVICAL CESAREAN SECTION

Median suprasymphyseal incision exposing the lower uterine segment. The visceral peritoneum is incised transversely where it is loosely attached slightly above the bladder reflection.

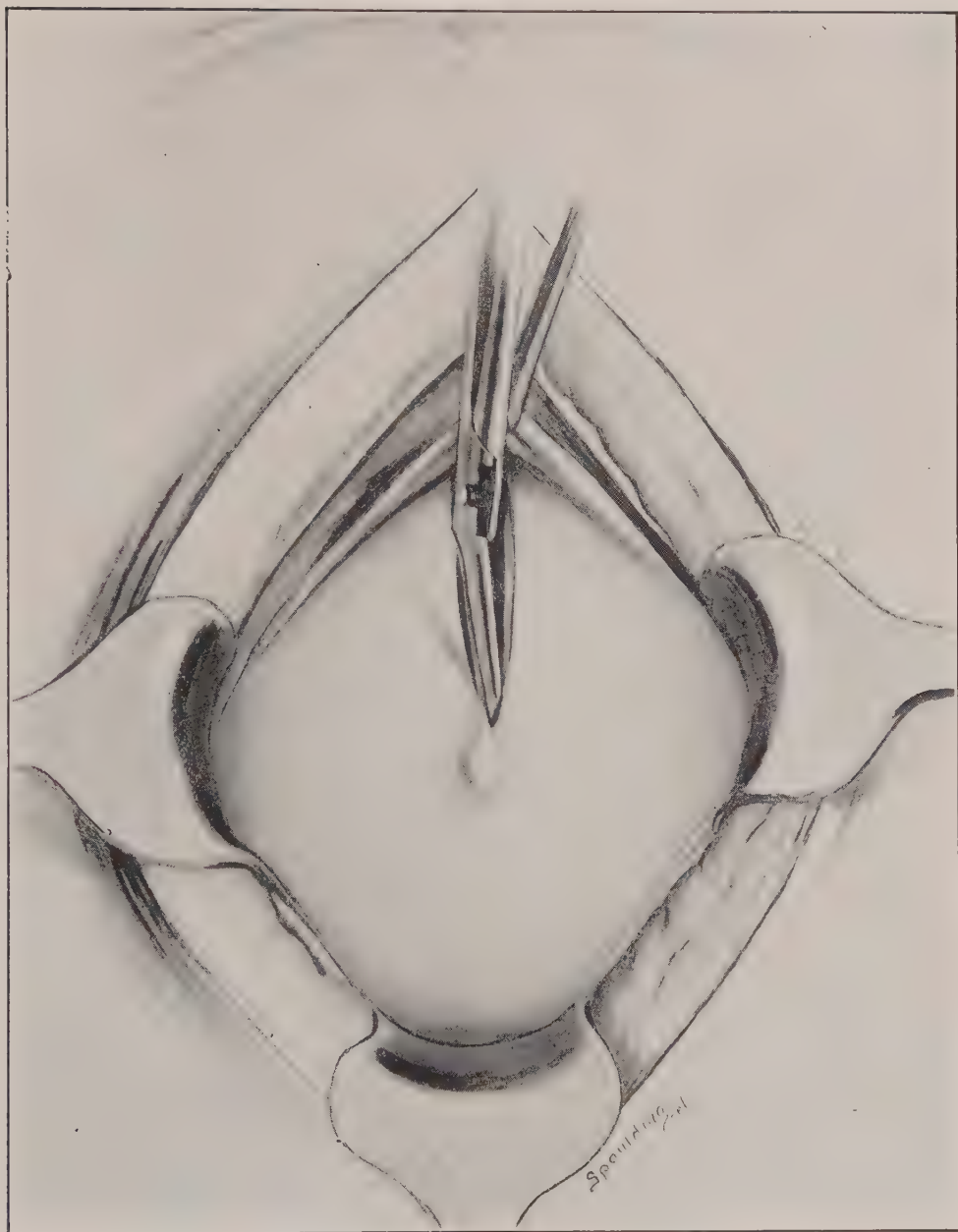


FIG. 60.—LOW OR CERVICAL CESAREAN SECTION.

A lower flap of peritoneum is separated with the bladder which is held under the symphysis by a retractor. An upper flap of peritoneum is raised and is held by an Allis forceps. The lower segment is incised with bandage scissors to protect the child's head.



FIG. 61.—LOW OR CERVICAL CESAREAN SECTION.

With the index finger in the child's mouth the face is turned to the incision. The left hand is introduced under the vertex and pressure is made on the fundus, the head is thus easily delivered. Forceps are practically never used.

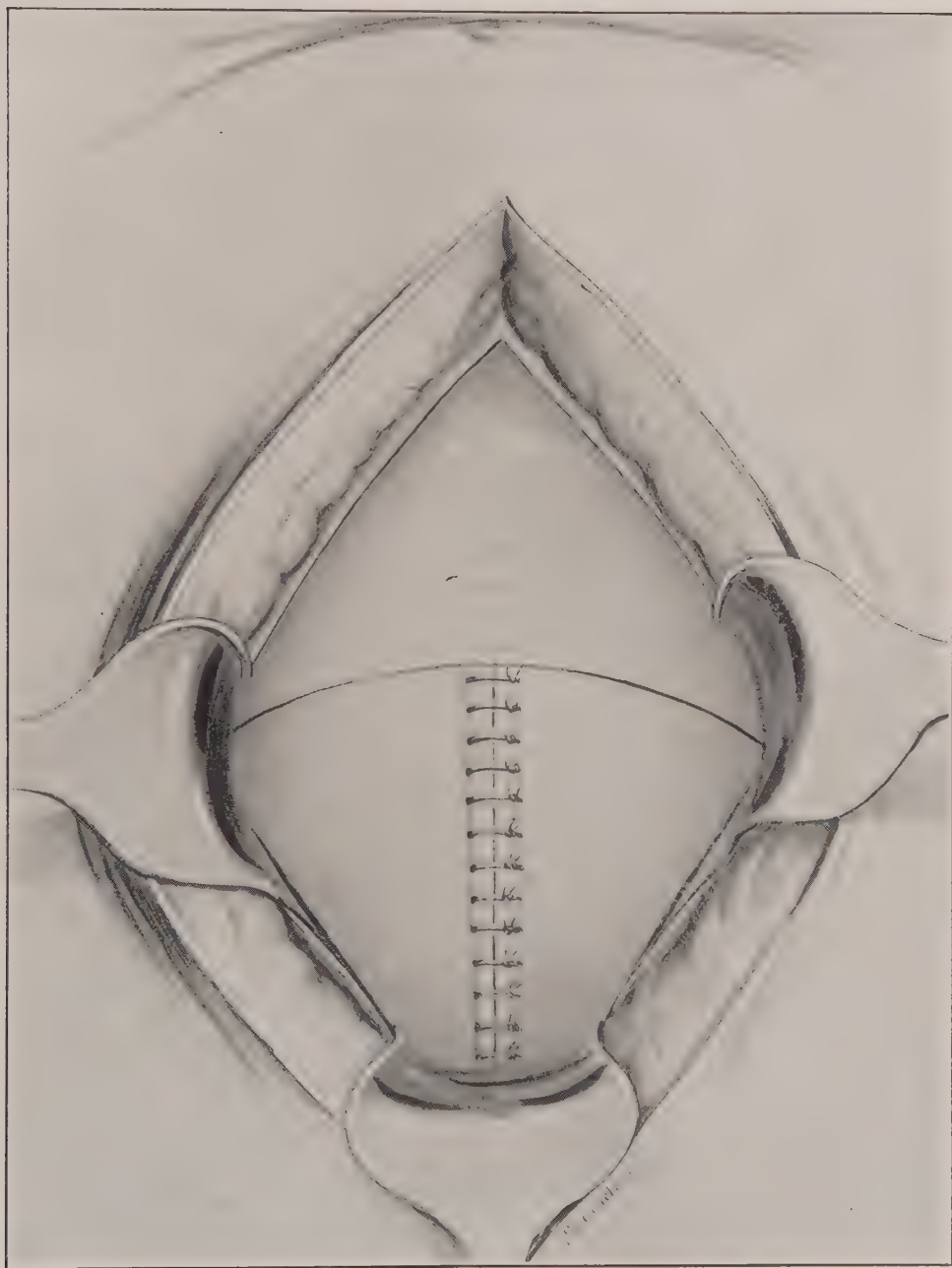


FIG. 62.—LOW OR CERVICAL CESAREAN SECTION.

The cervical incision is sutured, in one layer, with interrupted sutures of No. 2 chromic catgut. The upper flap of peritoneum is brought down but not anchored in any way to the uterus.

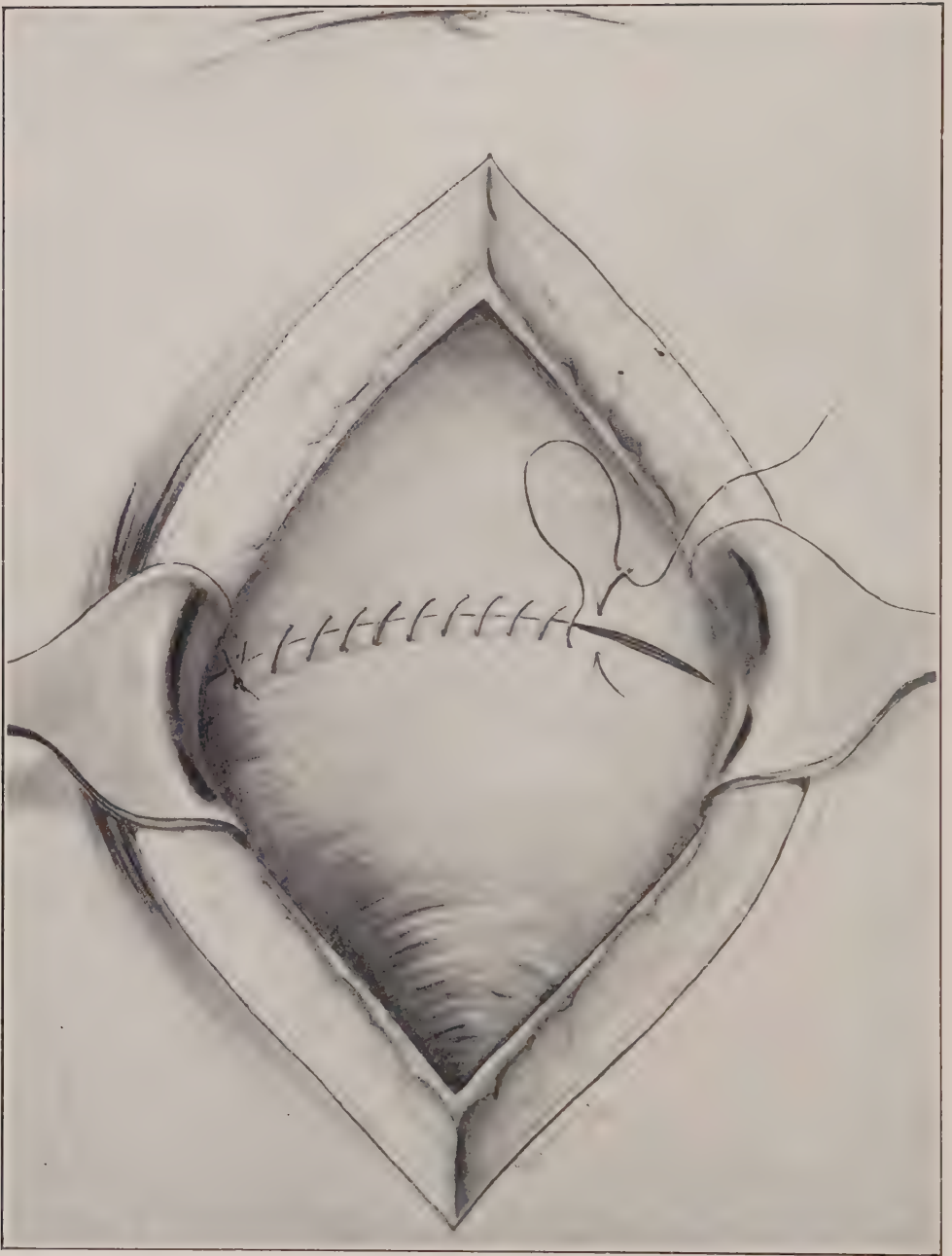


FIG. 63.—LOW OR CERVICAL CESAREAN SECTION.

The operation is completed by uniting the flaps of peritoneum, upper and lower, with a continuous suture of fine chromic catgut. The flaps are not attached to the uterus so as to facilitate the separation of the bladder in subsequent operations.

Second Step.—TRANSVERSE CERVICAL INCISION ; DELIVERY.—The uterine peritoneum is incised transversely, an upper and a lower peritoneal flap is made, the bladder is separated with the lower flap. A Doyen retractor is placed over the bladder to protect it. A small transverse incision is made, with a knife, as low as possible in the cervix, in the median line; this is extended laterally with bandage scissors curving the incision upwards, so that the concavity is towards the symphysis. This is done to give more room. The delivery is then accomplished as described above, under longitudinal cervical incision (page 302).

Third Step.—CLOSURE OF THE TRANSVERSE CERVICAL INCISION AND SUTURE OF THE PERITONEAL FLAPS.—The cervical incision is closed in two layers with continuous sutures of No. 2 chromic catgut. The first layer takes in the endometrium and part of the muscle. The second layer takes in the remainder of the myometrium and the fascia of the lower uterine segment and completely covers the first. The peritoneal edges are now united with a continuous suture of No. 0 chromic catgut, thus making the transverse incision entirely retrovesical.

Fourth Step.—CLOSURE OF THE ABDOMINAL WALL.—This is accomplished as described above.

Convalescence.—In his 11 previous communications on the subject of cervical cesarean section, Phaneuf has insisted on the simple convalescence which follows this operation. As his experience with the method increases, he is more and more impressed with this fact. It certainly is not the ordeal of the old classical section. A rare case develops a moderate soft distention, but in his series, it has always been a soft distention causing the puerpera no discomfort. The patients are free from ileus, the temperature and pulse remain near the normal line, and no signs of peritoneal shock are observed. If the operation accomplished nothing more than the comfortable puerperium, it would be worth while doing for this reason alone.

VAGINAL CESAREAN SECTION

The literature since 1921 contains very little about vaginal cesarean section. The great advantage of this method is its extraperitoneal approach of the uterus, therefore the marked increase in safety over the classical operation. Since the more general adoption of the suprasymphyseal or transperitoneal low abdominal cesarean section, it has been found that the increased protection against infection secured by this procedure is almost as great as that of vaginal hysterotomy. For this reason and also because of the simpler technic, the low abdominal operation has been substituted for the vaginal in a number of clinics. This has tended to further limit the indications of vaginal hysterotomy.

At the present time vaginal cesarean section finds its largest field of usefulness when an indication for the rapid emptying of the uterus arises up to the end of the eighth month of pregnancy in:

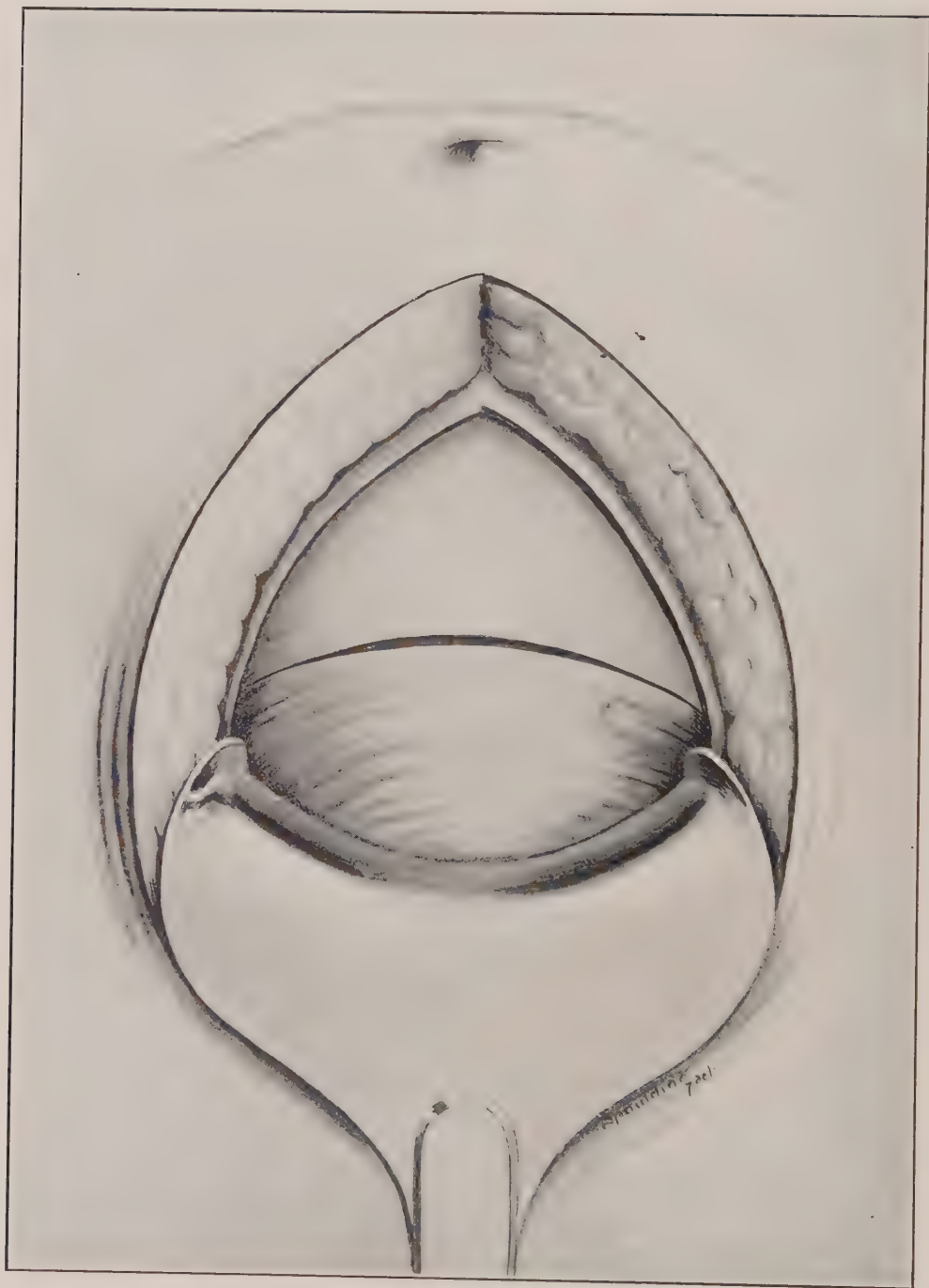


FIG. 64.—LOW CESAREAN SECTION.

Transverse cervical incision. Median suprasymphyseal incision exposing the lower uterine segment. The visceral peritoneum is incised transversely where it is loosely attached slightly above the bladder reflection.

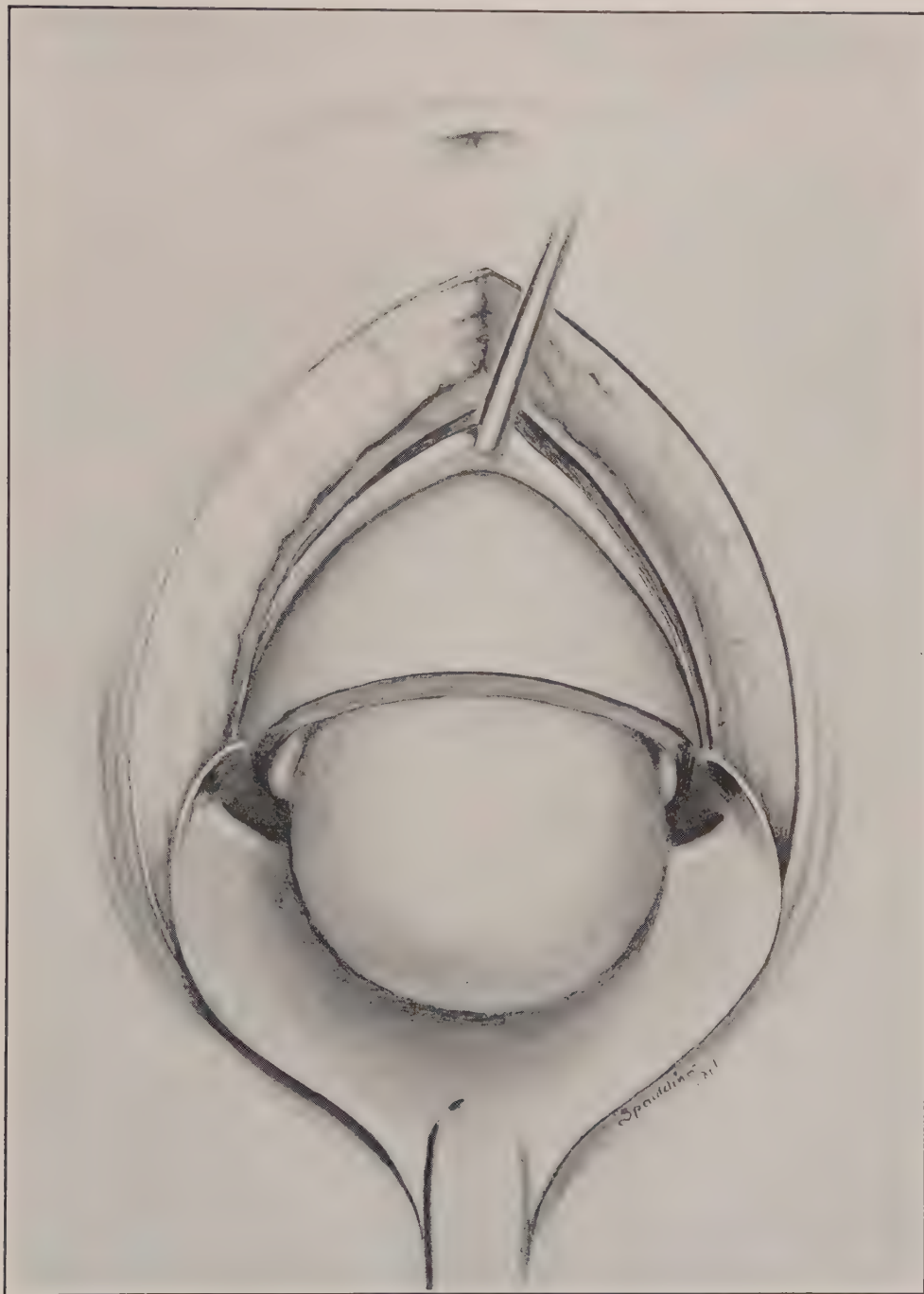


FIG. 65.—LOW CESAREAN SECTION.

Transverse cervical incision. A lower flap of peritoneum is separated with the bladder which is held under the symphysis by a Doyen retractor. An upper flap of peritoneum is raised and held by Allis forceps. The lower segment is incised transversely with bandage scissors to protect the child's head. The vertex is delivered by raising it with the left hand and making pressure on the fundus with the right hand.



FIG. 66.—LOW CESAREAN SECTION.

Transverse cervical incision. The cervical incision is sutured in two layers with continuous sutures of No. 2 chromic catgut.

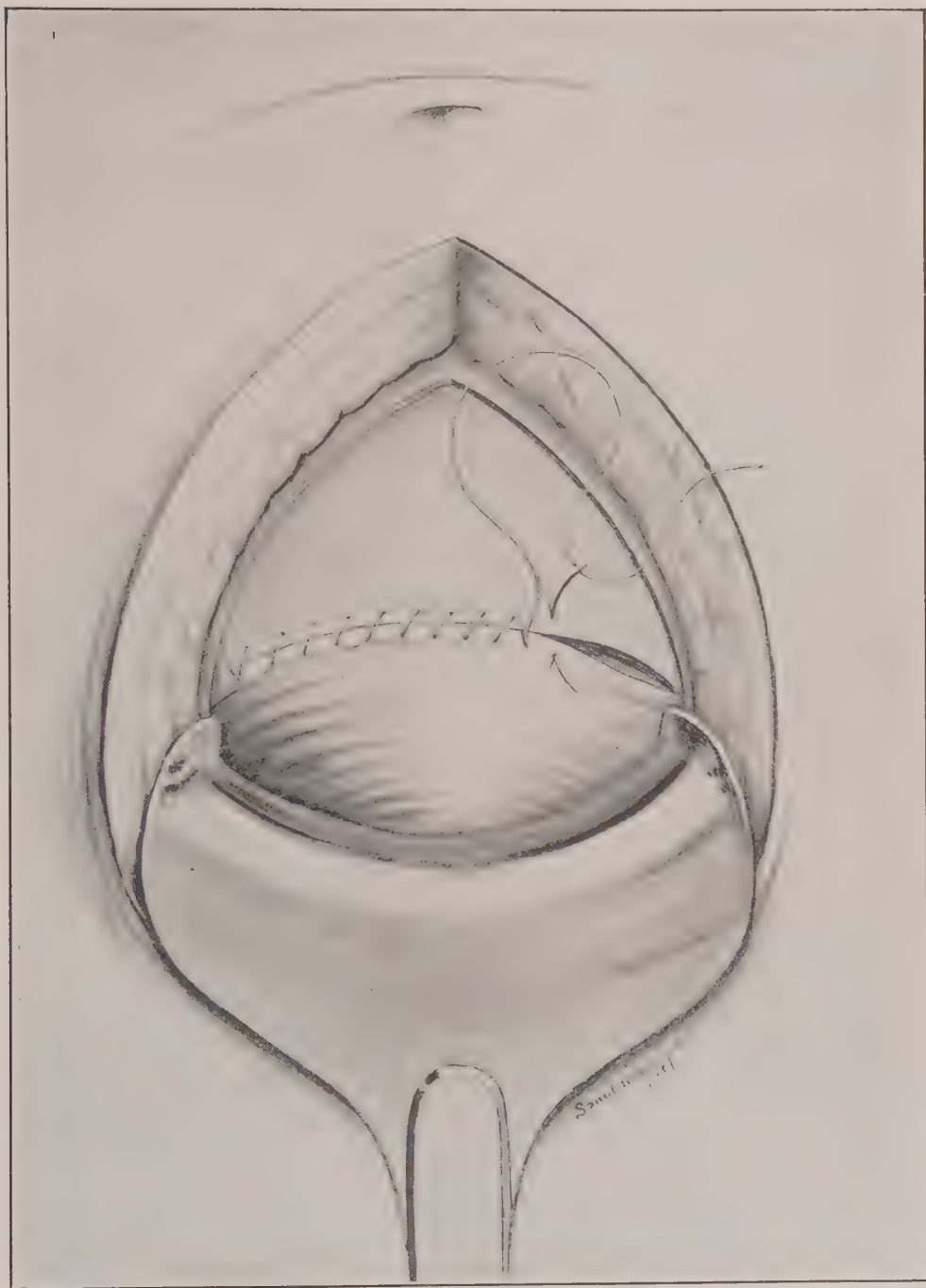


FIG. 67.—LOW CESAREAN SECTION.

Transverse cervical incision. The operation is completed by uniting the flaps of peritoneum, upper and lower, with a continuous suture of fine chromic catgut. The cervical incision is now retrovesical or subperitoneal.

1. Lesions of the heart, lungs and kidneys.
2. Toxemia of pregnancy in the presence of impending convulsions and in gravidæ who did not improve under the conservative treatment.
3. Pernicious vomiting of pregnancy in a gravida who is dehydrated and exhausted and who would not stand a long labor.
4. Premature separation of the normally inserted placenta in its milder forms.

Vaginal cesarean section is but seldom done at the full term of pregnancy, because of the greater difficulties in technic, because of the danger of the incisions tearing in the peritoneal cavity and because of the danger of injuring the bladder on account of the large size of the child.

Before attempting vaginal hysterotomy certain requirements are essential. The tissues must not be edematous or friable. The uterus must be movable so that the cervix may be readily brought down into the vagina. The pelvis must be ample. The child must not be too large. In the absence of these requisites, the vaginal cesarean section should not be considered, regardless of the indication.

Technic of Operation.—A weighted speculum is introduced in the vagina to expose the cervix. The cervix is brought down by means of two volsella, one at each lateral angle, and dilated with Hegar dilators to assure drainage. A suture of chromic catgut is placed at each lateral angle of the cervix and left long. These sutures facilitate the bringing down of the cervix after delivery. If the cervix is not readily brought down by this method, a No. 4 Voorhees bag is introduced in the uterus; it is filled with 1 per cent lysol solution, and used as a tractor. A transverse incision is made in the anterior vaginal wall at the point of attachment of the bladder to the cervix, and the bladder, together with the vaginal wall, is dissected upwards to the reflection of the anterior peritoneal culdesac. The bladder is never separated from the vaginal wall, as is illustrated in most textbooks, as this has been found to be unnecessary and because it predisposes to bleeding and injury to the hyperemic and friable vaginal wall.

The bladder is now held under the symphysis by means of a wide retractor, and the anterior lip of the cervix is incised up to the vesico-uterine culdesac, care being taken not to enter the peritoneal cavity. The posterior lip of the cervix is pulled upwards toward the symphysis, with volsella or the bag, as the case may be, and a transverse incision is made at the junction of the vagina and the cervix. The posterior culdesac and the rectum are reflected downwards, and the posterior lip is incised as far up as possible, care being taken to respect the abdominal cavity.

The instruments are now removed and the hand is introduced in the uterus, an internal podalic version and a breech extraction are performed in the usual way and the placenta and membranes are extracted manually. By injecting pituitary extract and an aseptic preparation of ergot, the bleeding is usually controlled so that packing is rarely necessary.

The cervical incisions are closed with interrupted sutures of No. 2 chromic

catgut: The vaginal incisions are sutured in the same manner with the same material.

When the fetus is small it is not necessary to incise the cervix posteriorly, as the anterior incision usually gives enough room for its extraction.

Indications.—At the fortieth annual meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, held at Asheville, North Carolina, September, 1927, Phaneuf presented his personal statistics on 27 vaginal cesarean sections in a paper entitled, "The Place of Vaginal Cesarean Section in Obstetrics." Anterior cervical incisions were made in 12 patients, and anterior and posterior incisions in 15.

The indications for the 27 operations were the following:

Toxemia of pregnancy (convulsive type).....	6
Toxemia of pregnancy (non-convulsive type).....	5
Toxemia of pregnancy (pernicious vomiting type).....	3
Toxemia of pregnancy (ablatio placentæ).....	2
Toxemia of pregnancy (pyometra; rigid cervix).....	1
Toxemia of pregnancy (previous nephrectomy; retained macerated fetus; eighth month of pregnancy).....	1
Chronic nephritis and pregnancy.....	1
Pulmonary tuberculosis (advanced).....	1
Mitral stenosis and regurgitation; pyelitis.....	1
Congenital pulmonary stenosis.....	1
Hydramnion; rigid cervix.....	1
Rigid cervix; long labor.....	2
Pyelitis	1
Attempts at delivery before admission for hemorrhage (6½ months of pregnancy; dead fetus; contracted uterus).....	1
TOTAL	27

One mother died, a maternal mortality of 3.7 per cent. She was a tertigravida, who, in her first pregnancy, had been delivered by a classical cesarean section for uterine apoplexy, and spontaneous incomplete rupture of the uterus. Her second pregnancy was terminated by a low cervical abdominal cesarean section. Her third pregnancy had reached full term, although her uterus corresponded in size with a five months gestation. On admission she showed signs of toxemia; she had developed uterine hemorrhages and a septic purpura. As she was failing rapidly, it was thought that her only chance rested in emptying her uterus. This was done by vaginal cesarean section. Pyometra was found to be present, a half a liter of foul pus being evacuated from the uterus as well as a macerated, five-month fetus. There was no difficulty with the operation, which was rapid. The patient was returned to her bed in poor physical condition. She died three hours later from shock, toxemia and severe uterine infection.

Twenty-four of the infants did not survive, a total fetal mortality of 88 per cent. If we excluded 9 macerated and 8 stillborn children the corrected fetal mortality was 37 per cent. Naturally these infants were markedly pre-

mature and toxic. The 26 mothers who recovered were free from complications, save one. In this case a vesicovaginal fistula developed. This is almost closed at the present time, but it may necessitate operative interference later if nature does not close it entirely.

Three women had pelvic deliveries following vaginal cesarean section. Two had normal deliveries, and a third had a version and extraction, and subsequently a normal delivery.

The reviewer concluded his paper as follows:

1. Vaginal cesarean section is a useful operation when an indication for immediate delivery arises in a gravida with a long, rigid, undilated cervix, up to the end of the eighth month of gestation.

2. The operation may be done at term, as shown by one of the cases of this series; but here the difficulties are greater, and there is danger of the incisions tearing in the peritoneal cavity because of the large size of the child.

3. A previous low cervical cesarean section complicates the technic of the operation since the anterior peritoneal culdesac has been obliterated. This may predispose to injury to the bladder during delivery.

4. Since the operation is extraperitoneal, postoperative complications are negligible.

5. The puerperium, as a whole, resembles that of any operative pelvic delivery.

6. The low transperitoneal abdominal cervical cesarean section which offers nearly as much protection against infection as does the vaginal hysterotomy, has displaced the latter operation in a number of clinics because of its simpler technic.

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